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ON THE COVER: Modeled after one of the most powerful full-size aerobats on the airshow circuit, the Hangar 9 120cc Model 12 Viking performs like its bigger brother. Don't miss our exclusive review this issue. (Photo by John Reid)

THIS PAGE: Decked out with retracts, LED lights, and an abundance of scale firepower, the FMS A-10 Thunderbolt II PNP is mission ready. (Photo by Andrew Griffith)

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Preflight

BY DEBRA CLEGHORN | EXECUTIVE EDITOR

Product Picks of the Year

This issue marks our eighth annual *Model Airplane News* Editors' Choice awards. While you might think that time and experience would help us more easily choose the winners, I can assure you they have not (our decision-making seems to get more difficult every year!). The products that we choose must exceed our expectations for quality and performance as well as have that "wow" factor that sets them apart from others in their class. This issue, we are very excited to announce our picks for 2017's Plane, Innovation, Radio, and Drone of the Year, which you'll find on page 65.

Helping new modelers succeed is a basic tenet of *Model Airplane News*, and this month, we help fledgling pilots assemble their first ARF in our feature **"Build It Right."** If you find the tips and techniques in this article helpful, be sure to visit ModelAirplaneNews.com and head over to our Getting Started section, which features more beginner-friendly articles like this one.

We love it when we have the opportunity to give our readers the first look at much-anticipated RC planes and products, and this month, we're especially pleased to share our exclusive review of Hangar 9's latest giant-scale aerobat: the **Model 12 Viking**. This 120cc-size plane is intended for experienced builders and pilots, and our reviewer, Jason Benson, was jazzed to get the opportunity to assemble and test-fly this high-performance biplane. Don't miss his full review on page 26, and be sure to watch the video of this plane at the field (embedded in your digital edition—free to all subscribers!—and at ModelAirplaneNews.com/viking.

If you're looking for a different type of adrenaline rush, we review an indoor drone that you can race in your living room! The **RISE Vusion House Racer** even comes with FPV goggles for the ultimate first-person-view racing experience, and optional ring and pylon gates amp up the fun.

This issue is also packed with how-tos, from **25 of our favorite field and bench tips** to setting up redundant power systems in your giant-scale aircraft. We also share why you should consider programming your servos to make aircraft setup easy, and if you fly with glow power, you'll appreciate guru Clarence Lee's advice on troubleshooting older engines.

For nearly 90 years, *Model Airplane News* has been your source for RC news, reviews, and how-tos, and with your help, we'll do our best to continue that legacy. What would you like to see more (or less!) of in your magazine? Please send me an email at debrac@airage.com; I look forward to hearing from you.

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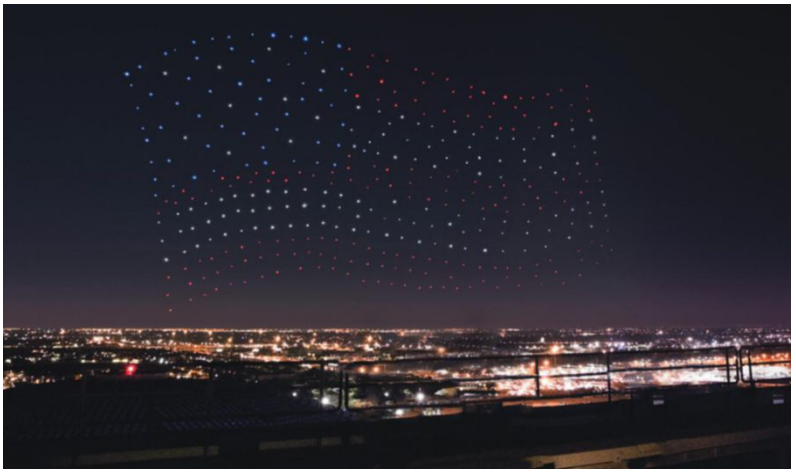
Airwaves

YOUR FEEDBACK

We love hearing from our readers: Your emails, tweets, and comments quickly let us know what you'd like to see more (or less!) of in upcoming issues and online. Here's what some of you are saying about *Model Airplane News* magazine.

Facebook Lady Gaga's Drones

By now, it's safe to say that everyone on the planet knows that Lady Gaga used drones in her light show above the stadium for Super Bowl LI. We did some investigating and quickly posted all we could find about the Intel Shooting Star Drones, which use swarm technology to really put on a show. Here are just a few of your comments from Facebook.



BL: *According to* Digital Circuit News, *the drones were filmed two days earlier over the stadium and then edited in, as FAA prohibits drones being flown over groups of people. Still, a great show!*

RG: *Swarming technology. Although local, I can see military use for this. It's already being developed.*

BH: *Disney had a drone show at Disney Springs during the holiday season. I don't know, though, if they do one every night. They're pretty amazing to see.*

JH: *I wonder if they registered every one of the 300 drones with their FAA number.*

JM: *That is cool.*

ModelAirplaneNews.com Vacu-Goggles

We recently posted a how to article that shows the basics of vacuum-forming using a homemade vac-box and common supplies. Our own Gerry Yarrish needed to produce a set of 1/3-scale goggles for his scale "mini-me" pilot occupying the cockpit of his Balsa USA 1/3-scale Fokker Dr.1 Triplane. His technique is very easy, and Gerry showed all the steps—from making the wooden forming plug to the simple vacuum-cleaner-driven vacuum box he tinkered together with a Plexiglas forming deck. This post drew a lot of your attention.

Mark Rangel*: Very informative. I thought it would require more-involved equipment.*

Peter Jacob: *Love the simplicity of your approach. Keep it simple!*

Walter Harding: *Cool! And I love your homemade pilot figure as well.*

Michael Cummings: *The perfect accessory often missing with other WW I pilot figures.*

In Our Mailbox Power Loading

I read with great interest what Greg Hahn wrote in the April issue. I must agree with most of what he said in his "Speed, Props, and Power!" article. It is ironic that he chose a Ziroli Texan as an example. In 1982, Nick Jr. and I each built my 101-inch AT-6 and powered them both with 2.4ci (38cc) Koritz engines. We were very happy with their performance and flew them at many events. I also flew my 94-inch-span P-40 Warhawk with a Quadra 35, although it was a little light on power and made you pay attention. There is no doubt that, today, modelers do overpower their scale models. If you mention it, the response is usually, "I can always throttle back." Greg is also right about horsepower ratings. If you can get more than one horsepower per cubic inch out of a scale model engine and prop, patent it. What I don't agree with Greg on is the importance of scale speed. They all fly too fast and are seldom judged properly.–Nick Ziroli Sr.

Nick, it's great hearing from you. I also agree, and follow Greg's formula for power loading and propping my engines a little bit on the bigger side. Considering the feedback we've received, I think his article has opened a lot of eyes. Thanks so much for writing.–GY

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Tips&Tricks

USEFUL HINTS FROM MODELERS | Illustrations by Richard Thompson

MAGNETIC CATCH-ALL

Dropping a small nut or screw onto the workshop floor will more than likely lead to a missing hardware fastener, and of course, the one you lose will be the last one you had leading to an unscheduled trip to the hobby shop. Applying a stick-on magnetic strip to the edge of your workbench will act as a catch-all to prevent those hardware items from getting lost. Available at most hardware stores and home-improvement centers, the magnetic strip used to install storm windows and screens is ideal—and economical, considering the amount of hardware you won't lose.

Stephen Philbrick, Torrington, CT

CONTROL CORRECTION

It can be confusing for new pilots to think of their right versus the airplane's right when their airplane is flying back toward them, so this old trick will help. Always move the control stick toward the low wing to correct it back to straight and level. This works every time. Soon it will become second nature, and you'll start doing it automatically without much thought.

Jim Newman, South Lafayette, IN

EASY FIELD BALANCER

Use this easy-to-make device in the field to balance a propeller. It is made out of a sheet of paper rolled into a sharp cone shape with a thread inserted through the apex and glued in place. Roll the paper to a point, and use some clear tape to keep it from unraveling. Cut the cone so that the large end is a little bigger than the shaft hole on the largest prop you use. Pass the thread through the prop bore as shown, and hold it in your hand to balance the prop. Remove material from the heavy side until it hangs horizontal. It isn't pretty, but it works and costs nothing!

Jerry N. Simpson, Midvale, UT

HEAT-SHRINK CLEVIS KEEPER

Everyone uses short lengths of fuel tubing as clevis keepers, but I have found that you can do the same thing with a 1/2-inch length of heat-shrink tubing. Cut to size, slip it over the clevis, connect the clevis to your control horn, and then use a heat gun to tighten it up. You can find shrink tubing in different colors to match your plane, so it's more attractive, to boot!

Rick Bell, Farmington, CT

SEND IN YOUR IDEAS! We want your ideas for Tips & Tricks! This month's winners will receive a *Model Airplane News* baseball cap. Send a photo or rough sketch and a brief description to MAN@airage.com or *Model Airplane News*, c/o Air Age Media, 88 Danbury Rd., Wilton, CT 06897 USA.

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Pilot Projects

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BALSA NOVA **Jeff Ziegler, Moline, IL**

This photo may look like a cartoon, but it's real! Jeff took plans for the 1.20-size Morris Hobbies Balsa Nova and shrunk them to make a 60-inch-span model. He enlarged the control surfaces for 3D flying and built the model with a foam-core wing and carbon-fiber landing gear. An Extreme Flight Torque motor and Castle Creations 90 speed control provide the get up and go, and Jeff notes, "This plane is not only a looker but also a monster."

RV4 SQUADRON **Terry Bolin, Neosho, MO**

Terry writes that the members at the 4-State RC Club still like to build from kits, as evidenced by these three Great Planes RV4 models. Five club members participated in a group-build over the winter. He adds, "We enjoy the woodworking side of our hobby and like to see how different each person's plane is finished."

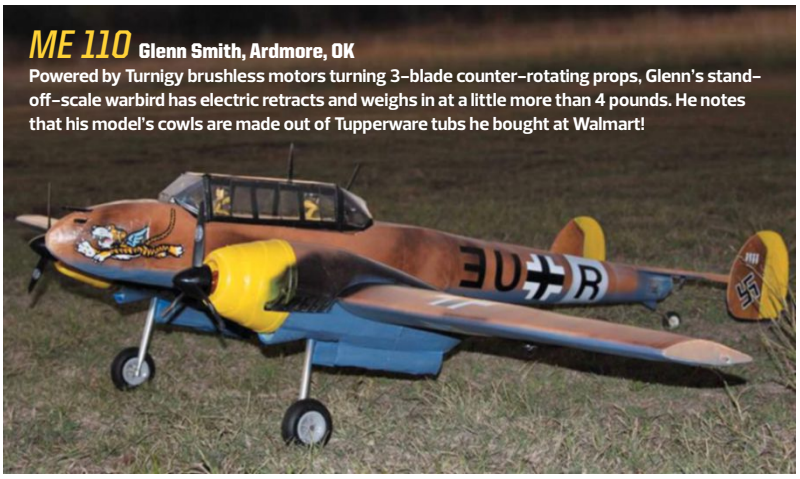
CIVILIAN BIRDDOG

Ron Lesyk, Elk Point, AB, Canada

Built from Ron's plans and drawings, this 128-inch-span model is made out of balsa and foam-core, and it's powered by a Zenoah 26cc gas engine. Ron notes that he calls it his "Civilian Birddog" because of the great view for the pilot and adds, "It has no bad flight characteristics, and will land as slow as you can walk." We think it's terrific.

ME 110 **Glenn Smith, Ardmore, OK**

Powered by Turnigy brushless motors turning 3-blade counter-rotating props, Glenn's stand-off-scale warbird has electric retracts and weighs in at a little more than 4 pounds. He notes that his model's cowls are made out of Tupperware tubs he bought at Walmart!



SEND IN YOUR PICTURES! *Model Airplane News* is your magazine, and we encourage reader participation. Email your high-resolution images to MAN@airage.com, with your contact information and details on your project. Every pilot we feature will receive a *Model Airplane News* baseball cap, and the "Pilot Project of the Month" winner will receive a *Model Airplane News* "swag pack."

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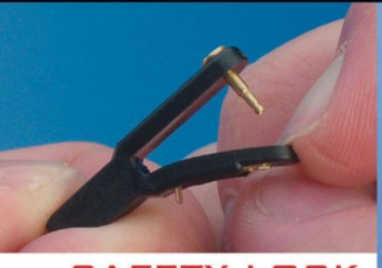

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Available in silver warbird and Miss America race schemes, this P-51D Mustang is quick and easy to assemble (no glue required!) and flies like it's on rails. Made out of AeroCell foam, each comes with an installed pilot bust; a magnetic hatch; installed brushless power system and servos; and removable, fixed landing gear. Optional retracts and flaps (gear and servos sold separately) add detail and improve flight performance. Each 40-inch-span warbird costs $119.99. **towerhobbies.com**

Futaba CPS-1 Channel Power Switch

Now you can control your model's LED lights! Just plug the compact and lightweight CPS-1 into a vacant receiver channel and assign it to a switch so that you can turn your lights on and off at will. The CPS-1 costs $39.99. **futabarc.com**

Futaba 6K V2

This updated 6-channel radio has Throttle Integrate, a neat feature that links the radio's timer speed to throttle position to reflect the higher consumption of fuel or battery power. It also has an additional two channels of telemetry capability through the included R3006SB receiver's SBus/SBus2 port. The $199.99 6K now has multirotor-specific flight modes that provide greater flexibility and allow the pilot to control the camera-gimbal position. **futabarc.com**

Valley View RC Safe-T Airplane Holder

This 14-inch-tall, 100 percent stainless-steel holder will keep your airplane stationary while you start it. When your model is ready to go, simply pull it back and the holder will fold down and allow your plane to taxi to the runway. This tool has been tested with a 120cc, 35%-scale airplane at full throttle! It costs $49.95. **valleyviewrc.com**

RBC Kits T-Lizzie

Take a trip down memory lane with this old-timer kit! Its tab-lock design makes construction easy, and it comes with CNC-cut formers and ribs, a two-piece wing, and easy-access motor/battery compartment. The 4-channel, 56-inch-span kit is intended for an 840Kv motor and 3S 3300mAh LiPo, and it costs $104.00.
rbckits.com

E-flite Commander mPd 1.4m

With only eight screws required for assembly, this 53-inch-span flier will get you in the air and having fun in no time! Its Hands-Free Servo Connection System lets you plug in or remove the wings without having to fuss with servo leads, and it comes with a 15-size brushless motor system and servos installed. Factory-installed flaps allow short takeoffs and landings, and its wide flight envelope goes from slow, smooth moves to aerobatics. The Bind-N-Fly Basic model is $229.99; the Plug-N-Play version is $199.99.
e-fliterc.com

ProTek RC Prodigy 625 Duo Touch

This AC/DC charger has two independent channels capable of 25 amps/200 watts of charging power, so it's a great choice for high-voltage LiPo batteries. It features dual back-lit touchscreens and 20 user-programmable profiles, and supports 1S to 6S LiPo, NiMH, and lead-acid packs. It costs $249.99.
amainhobbies.com

DJ Aerotech 1.5m Chrysalis E-Powered Sailplane

An updated version of the popular the Chrysalis hand-launch glider, this electric-powered sailplane kit includes laser-cut parts, a fully photo-illustrated assembly manual with full-size plans, and all hardware required. The wing has been updated with carbon spar caps and a laser-cut shear web system, which makes construction simpler and stronger. A Suppo 2208-12 motor is recommended. The kit costs $85.00.
djaerotech.com

The Blue Max

The eighth annual WW I gathering is a big success

TEXT & PHOTOS BY **DAVID HART**

The Blue Max is a popular Dawn Patrol event, so here's a sunrise flightline photo. That's Scott Lee's 1/3-scale Sopwith Pup catching the morning's first light.

Shown here is the noontime runway lineup of the models that were at the event. This gave the spectators the opportunity to get an up-close look of the models and talk to the owners about them.

Here are some of the details on Stephen Thomas's Fokker Triplane.

EVENT SPONSORS

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While the northern part of the country was dealing with winter temperatures, Sanford, Florida, was enjoying perfect RC pilot weather for the eighth annual Blue Max event. Hosted by the Sanford Aeromodelers R/C Club, The Blue Max 1903–1919 Scale R/C Challenge & Fly In is for early-aviation and World War I airplanes. This enjoyable modeling extravaganza is a popular venue for the pioneer aircraft, the WW I fighter, and the pilots that flew them, and it offers a great opportunity for RC pilots and aviation enthusiasts alike to get together and re-create a special moment in time. History is preserved with the Blue Max as there aren't many museums or airfields left where you can go to and see WW I aircraft fly. In the not-too-distant future, WW I RC events like the Blue Max may be our only link to the past and early aviation.

Founded by Mike Celesky, John Olson, and Ron Prestin, the event would not exist without their expert knowledge and hard work. The event was tailored for the vintage tail-draggers, and these men wanted to create an event where the efforts of both WW I model builders and fliers would be on display. The first two events, in 2010 and 2011, were held at Kermit Weeks's Fantasy of Flight museum in Polk City, Florida. In the fall of 2011, a change of location was needed to handle the needs of the large-scale WW I RC aircraft that started showing up. Pilots then suggested a dedicated flying site be found that was designed for RC planes, with assembly tables and power outlets for charging equipment. Scott Lee and the members of the Sanford Aeromodelers R/C Club welcomed the opportunity to hold the event. In 2012, the event was moved to their club field, where the Blue Max now makes its permanent home.

THE EVENT

At this year's event, there were nearly 50 registered pilots, and most of those pilots arrived with more than one plane, so there were about 85 aircraft on the flightline. Some pilots arrived Wednesday evening to get their RVs set up and to claim their space on the flightline. There were also more than 500 spectators in attendance at the three-day event. Static judging started on Friday and was open until 11 a.m. on Saturday. Flight judging started on Saturday, and the pilots had to fly two rounds for the judges. There was also complete unlimited open flying all three days. Throughout the entire event, show announcers Jay Fiero and retired Lt. Col. Ian M. Mackay shared their extensive aircraft knowledge and kept everyone entertained. (Thanks, guys!) On Saturday at noon, the runway was opened to the crowd, and the pilots brought their models out so that the spectators could really get an up-close look at these flying works of art. During the Saturday noontime demo show, Billy Freeland showcased his turbine-powered F-16 jet. The contrast of the jet and all the early aeroplanes demonstrated just how far aviation has evolved.

The flight judges were (left to right) Tim Len, Ron Parchment, and Dave Krauser.

Heading out on his next flight, Stephen Thomas flew his Triplane a lot over the weekend.

George Hunter poses with his award–winning D.VII.

GEORGE HUNTER'S BIG D.VII

Coming in from Auburn, Alabama, George Hunter brought his beautifully executed Fokker D.VII, which is exactly 1/3 scale and has a wingspan of 116 inches. With a length of 91 inches, the airplane is completely scratch-built, using both Proctor and Glenn Torrance's plans as references. The engine powering George's big biplane is a ZDZ Super 80 mated with a 28x10 Xoar scale Axial WW I propeller. Guidance for the aircraft is provided by his Spektrum DX18 transmitter, and the plane is covered with Solartex and GTM four-color lozenge printed fabric.

Here is a close–up in–flight shot of George Hunter's D.VII as he brings it in for landing.

Above: Curtis Switzer brings his Fokker D.VII onto the tail of Larry King's Curtiss Jenny.

Below: As you can see, there were a lot of Allied forces aircraft at this event.

On the flightline, Curtis Switzer helps Todd Bixby start up his Airco.

TODD BIXBY'S 1915 AIRCO DH.1A

From Orlando, Florida, Todd Bixby modeled his 1915 Airco DH.1A after one from Squadron 14, a unit that served in Palestine with five other DH.1A aircraft flying cover for BE2 aircraft. Todd built the model over a three-year period from plans drawn by John Cole. Made almost entirely out of hardwood, it has 1/32-inch ply ribs with basswood capstrips. It has spruce spars supported with scale flat rigging wires. He used 175-lb.-test 7x7 stainless-steel braided wire for the boom rigging, and the entire model has an ungodly amount

Todd Bixby's scratch-built DH.1A had a huge presence in the air, with a wingspan of nearly 14 feet.

Todd Bixby had some *very* old pilots in his Airco DH.1A.

of turnbuckles. The landing-gear struts and wing struts are all made out of fir. He used 12-inch child-bicycle wheels for which he had the spokes reset to achieve the correct British layout. Scale functional rib stitching was used on all the flight surfaces.

The dummy 120hp Beardmore engine was scratch-built using PVC pipe covered with resin in a mold to form the cylinders, while the crankcase is built up with plywood formers and basswood engine mounts. The airplane also has full cockpit detailing including wicker seats. The airplane is pushed with a DLE 111cc engine swinging a Xoar 30x10 pusher propeller.

Todd comments that, all in all, the Airco was a challenging build but was well worth the effort. It does get a huge amount of attention at the field.

John Stauber flew this beautiful Sopwith Pup. The prototype model for Balsa USA's new kit, the Pup is powered by a reduction propeller drive—equipped G-38 Zenoah engine.

Team Balsa USA

The guys from Balsa USA decided to make the trip down to Sanford all the way from Wisconsin, bringing down their now famous Balsa USA trailer. Pilots Mark Enderby, Chad Asmus, and John Stauber were also active on the flightline. A 1/3-scale Nieuport 17 built by Chad flew great and was powered with a Saito 84cc gas 3-cylinder four-stroke engine. He controlled the Nieuport with Spektrum radio equipment. John flew his 1/3-scale Sopwith Pup, which is the prototype for Balsa USA's soon-to-be-released, redesigned 1/3-scale kit. Powered with a Zenoah G-38 gas engine equipped with a propeller reduction drive, it turned a 32x18 propeller, which powered the Pup nicely. Covered in Solartex and painted, it has a 108-inch wingspan and is 77 inches long. The new kit will feature laser-cut parts, functional scale landing gear, prebent cabane struts, and landing-gear wires as well as a completely new photo-illustrated instruction manual.

Team Balsa USA readies the Nieuport 17 for another sortie.

A big sponsor of the event was Balsa USA. Here is their setup, where kits and other parts could be purchased.

Chad Costamire (Dr.I) and Curtis Switzer (D.VII) were entertaining everyone with their awesome formation flying.

Awards Banquet

The event's celebration and the presentation of the awards was staged at the Patio Grill, an outstanding restaurant in Sanford. To help set the mood as the pilots and guests found their seats, historical and original WW I footage of *The Great War in the Air* was shown on the television monitor. A big thank you to Connie Gekas and her team at the Patio Grill for letting everyone celebrate and toast the 2017 Blue Max! For more outstanding photos and event information regarding past and future Blue Max events, visit its website, thebluemaxrc.com.

At the banquet, Scott Lee presented Connie Gekas of the Patio Grill with a nicely framed token of appreciation for supporting the event.

Curtis Switzer (left) receives a Blue Max Outstanding Flight award for the flight of his Fokker D.VII.

AND THE WINNERS ARE...

Various types of aircraft were in attendance at the Blue Max, including ARF, scratch-built, kit-built, and many Balsa USA projects, all of which were eligible for the static and outstanding flight awards presented at the banquet. The following expert builders and pilots were recognized.

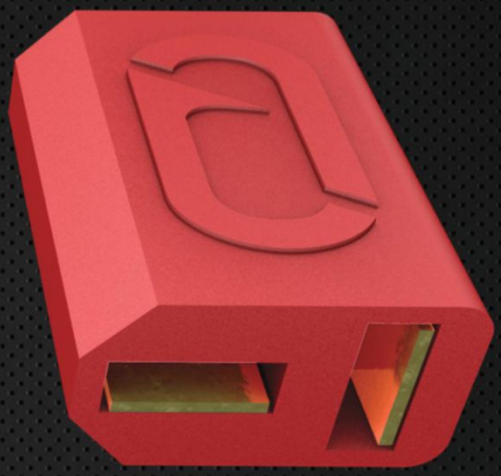
Outstanding Craftsmanship and Building Awards
Sponsored by Balsa USA
Curtis Switzer › Fokker D.VII
Todd Bixby › Airco DH.1a
Ron Gooden › Balsa USA Sopwith Pup
Ken Alsperger › Balsa USA Sopwith Pup

Outstanding Flight Awards
Sponsored by Steve & Julie Thomas of Bob's Hobby Center
Ron Gooden › Balsa USA Sopwith Pup
Mark Enderby › Balsa USA Sopwith Pup
Walt Moucha › Bristol Scout
Curtis Switzer › Fokker D.VII

Best Central Powers Aircraft
Sponsored by United Trophy
George Hunter › Fokker D.VII

Best Allied Forces Aircraft
Sponsored by United Trophy
Todd Bixby › Airco DH.1A

Pilots' Choice–Spirit of the Blue Max Award
Stephen Thomas



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Talk about a unique and colorful paint scheme: Charlie Starnes' Balsa USA 1/4–scale Triplane drew a lot of attention.

Bill Gray brings the triplane back to the hangar after a successful flight.

MARK YOUR CALENDAR

Next year's event has been scheduled for January 26 and 27, 2018. The guys are already planning some memorable additions to the next Blue Max, but both static and flight judging will continue. Balsa USA has continued to be a supportive and will be again the recognized sponsor of the four static and flight awards. If you haven't attended yet, mark your calendar and come down next year. This event's atmosphere remains relaxed and noncompetitive, and you'll want to experience firsthand this special WW I gathering. It truly is a special scale fun-fly event.

Trailing smoke, Walt Mocha simulates dogfight damage with his smoke system.

Hangar 9/ Horizon Hobby Model 12 Viking 120cc ARF

This giant can handle precision aerobatics, all-out 3D, and anything in between

BY **JASON BENSON** PHOTOS BY **JOHN REID**

EXCLUSIVE!

Hangar 9's latest flagship aerobat is a giant-scale stunner that's scaled after the Scandinavian Airshow Model 12 Viking in every way. This model can handle anything you want to throw at it—and more—all while looking awesome on the ground and in the air.

The Hangar 9 Viking is a built-up airframe that utilizes balsa and light ply throughout. The airframe is covered in Ultracote, and complex accent pieces such as the cowl, wheel pants, and canopy are made out of fiberglass and Lexan. These parts come painted and the color matching is excellent, so the finished plane looks terrific.

All the hardware necessary to complete the model is supplied: aluminum landing gear, carbon-fiber wing tubes for the plug-in wings, ball-link hardware for all control surfaces, plus a host of other odds and ends that will limit your need to make trips to the hobby shop. The

This 99.2-inch-span biplane looks impressive just sitting on the flightline! The wheel pants and cowl match the covering perfectly.

AT A GLANCE

MODEL
Model 12 Viking 120cc ARF

MANUFACTURER
Hangar 9 (hangar-9.com)

WINGSPAN
89.2 in.

PILOT SKILL LEVEL
Intermediate

ASSEMBLY TIME
20 hours

POWER REQ'D
120cc two-stroke gas

RADIO REQ'D
4-channel with eight standard servos

PRICE
$1,399.99

WHAT WE LIKE

- Scale appearance
- Beautiful finish
- Highly prefabricated
- Great flight characteristics

TRACKING IS NICE AND STRAIGHT, MAKING FLYING NICE STRAIGHT LINES AS EASY AS POINTING THE VIKING IN THE DIRECTION YOU WANT TO GO AND LETTING IT DO ITS THING.

Having the elevator servos in the tail helps keep pushrod setup nice and simple.

Model 12 Viking is a semicomplex aircraft that I recommend for intermediate modelers and pilots. This is mainly due to the size of the model, combined with the knowledge needed when working with large gas engines. Add to this the fact that this is a biplane and you can see why you would want a few models under your belt before tackling this aerobat.

UNIQUE FEATURES

Upon inspection of the kit contents, I was happy to see that Hangar 9 used round pinned hinges on all surfaces except the rudder. The rudder is hinged with flat hinges with removable piano wire, which will make any necessary repairs much easier. All surfaces come hinged and glued except for the left elevator, which is left off so that the stab can be slid through the fuselage during assembly. The hinges do come glued into the elevator, however, so you only need to glue one side. Be careful not to use too much epoxy on the elevator hinges. The hinge holes are sealed, and when I put a little too much epoxy in one of the holes, I noticed that the excess had escaped under the covering. I rubbed the area with my index finger to avoid having a lump

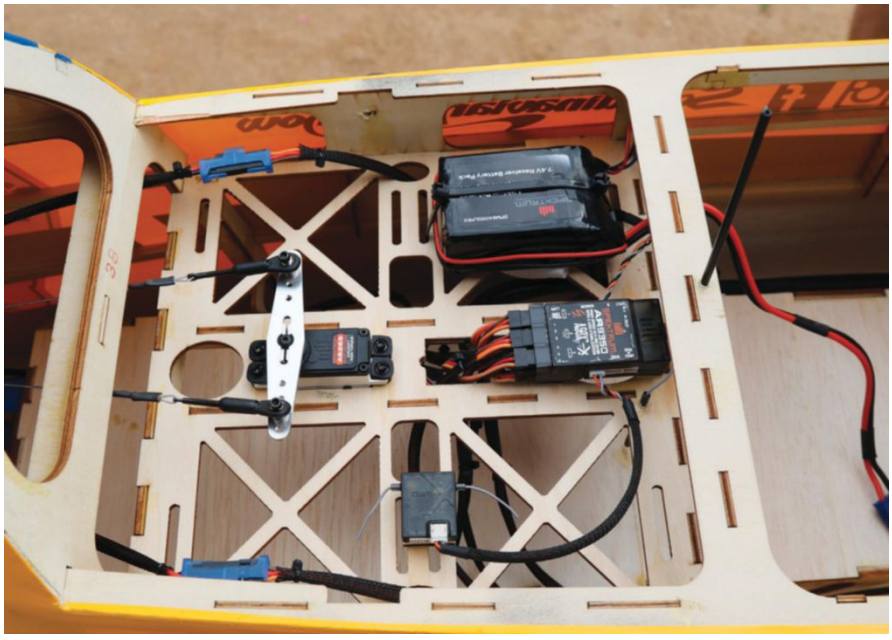
GEAR USED

RADIO
Spektrum DX18QQ, seven A6265 servos, one 6150 servo, AR9350 AS3X receiver (spektrumrc.com)

ENGINE
Evolution 125GX with Bisson mufflers

FUEL
87 octane pump gas mixed 40:1 with Red Line two-stroke racing oil

PROP
Mejzlik 27x10TH carbon



There is plenty of room under the hatch/canopy, giving you options for mounting your radio equipment.

The front-hatch area has plenty of room for your fuel tank, with easy access to everything else in the nose.

under the skin of the horizontal stabilizer.

Of course, one of the nice things about a large aerobatic biplane is the lack of retractable gear and flaps. The attachment points of the interplane struts—and the fact that there are four wings to attach—is enough complexity for one model. I have to say that Hangar 9 did a great job of simplifying this as much as possible. There are no flying wires to worry about on the wings, and everything is held together with 6-32 and 4-40 bolts.

All of the fiberglass and Lexan parts come drilled, so you can mount them using screws. Only the small covers for the cabane-strut attachment points in the center section of the top wing need to be glued in place with canopy glue.

The markings, which perfectly replicate those of the full-scale plane, are decals that are added at the factory. This is a nice touch and really helps speed the assembly process. In looking at the Scandinavian Airshow website, I concluded that Hangar 9 did an amazing job of making this model represent its full-scale counterpart.

All the hardware has standard threads (most are 6-32 socket head cap and button head screws). Everything is of high quality, and nothing is left to be desired. Even the included wheels are of high quality and are sure to provide years of service.

No modification was necessary to complete the Viking. One thing I noticed was that the manual only had steps for installing one elevator servo. Coincidentally, only one of the servo openings in the tail of the fuselage was precut to accept a servo. Opening the other side was simple enough, so just be aware that it will be necessary. One other thing that I strayed from the manual on was related to the routing of the extension wires for the top-wing aileron servos. Instead of clear tape, as recommended by the manual, I used clear heat-shrink tubing. I think it looks cleaner and will provide a longer-lasting solution.

Installation of the engine was straightforward.

PUTTING ON A SHOW

Owner of Scandinavian Airshow and the full-size Model 12 Viking, **Jacob Holländer** was nice enough to chat with me and answer a few questions about the Viking and his impressive experience as a full-scale pilot.

Model Airplane News: *You are obviously a very accomplished pilot. Please give us an overview of your piloting experience. What drew you to flight?*
Jacob Holländer: I flew for the first time at two weeks old. Then I started flying to airshows in the front seat in my father's Pitts S2A when I was a young boy. I did my solo in gliders when I was 14 years old and got my private pilot's license when I was 18, which is the youngest you can get it in Sweden. I flew my first Airshow at 18, flying a SAAB Safir in a four-plane formation. I crossed the Atlantic from the U.S. to Sweden in 1992 at 19 years of age in a SAAB Safir flying formation with my father in his Catwalk.

I flew airshows in a Yak-52, AN-2, and Pitts S2B from 1993 to 2005. And since 2005, I have been an airshow pilot with Viking, Thor, and Catwalk Skycats Wing Walking and L.L.P. I have been airline pilot since 1995.

MAN: *Is the Viking a stock airframe that can be purchased, or is it a modified version of a more basic airframe?*
JH: The model 12S is a stock offering from the factory, but it is modified with some tube enforcement where the passenger seat is in the standard model.

MAN: *How many Gs is the Viking capable of sustaining?*
JH: +/–12G are the normal G limits. At airshows, we limit it to +9/–6.

MAN: *Your website lists your performance as a 3D performance. Are there any maneuvers that you see us performing in the RC world that you wish the Viking could perform?*
JH: The big difference between the RC and full-size Vikings is the mass and power. With the full-size Viking, everything goes slower compared to the RC plane. Same with the power; you need to add much more power into Viking to be able to accelerate vertically out from hover. When time permits, I would like to explore more accelerated and high-rotation spins. I think that some maneuvers that you can do in an RC plane will be too violent to fly in a full-scale plane. But some maneuvers will become reality with new material and especially with more power.

Wow, what an impressive pilot to complement an equally impressive aircraft. For more information on Jacob, his team, and their aircraft, head over to the Scandinavian Airshow website at airshow.se.

The firewall has blind nuts preinstalled, and there are 1/4-20 screws of the proper length included. There are also pieces of hardwood dowel cut to length to be used as engine standoffs.

As always, I recommend a thorough review of the instruction manual before you begin assembly. This simple step can help you plan your actions and minimize issues. You know the saying: "Measure twice, cut once."

IN THE AIR

Ground handling is exceptional for a tail-dragger; it's predictable and positive. Takeoff is as simple as adding power slowly and gently keeping the model on the centerline using the rudder. At half throttle, she is airborne within about 100 feet. Landing takes a little more room, at a minimum of about 200 to 300 feet because of the amount of mass that needs to be slowed down.

GENERAL FLIGHT PERFORMANCE

Stability: The Model 12 Viking is extremely stable. The ample wing area keeps things nice and controlled even at slow speed. This plane was designed to handle 3D aerobatics, so even in high-alpha flight, I never felt that the aircraft was not fully controllable. Upright and inverted harriers were stable, and the rudder combined with ample fuselage side area provide great steering in these attitudes.

Tracking: Tracking was an area where the Viking surprised me. This plane would be comfortable competing in IMAC aerobatics. Tracking is nice and straight, making flying nice straight lines as easy as pointing the Viking in the direction you want to go and letting it do its thing. I balanced the Viking about a 1/4 inch aft of the recommended starting point. Even balanced a hair on the tail-heavy side, the Viking felt locked in. Slow rolls were laser straight, and I never noticed a tendency to "hunt" for the line.

Aerobatics: Aerobatics is what the Model 12 Viking is all about. From nice long slow rolls and high-energy snaps to high-alpha rolling harriers, the Viking is ready for action. I could write about the aerobatics this plane is capable of for pages! Knife-edge is incredible with the Viking and requires very little rudder to maintain altitude. With a little bit of aileron and elevator mixing, even knife-edge loops are uneventful.

I really enjoyed flying rolling circles with the Viking. Ample rudder authority and extremely axial rolling make for rolling circles that present beautifully. Both inside and outside rollers were a blast to fly.

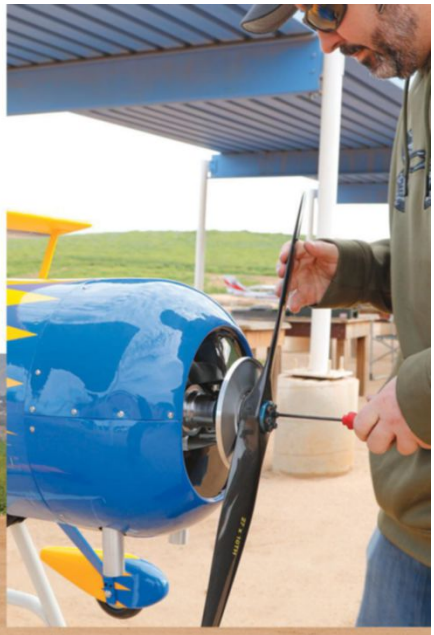
Glide and stall performance: With large amounts of drag due to having two wings and a lot of frontal area, biplanes aren't really known for their glide performance. The wings on the Viking are fairly thin, which helps this, but when the power is cut, she still slows down quickly. As long as you keep this in mind, you will not be surprised by the glide of this model. Just keep the nose down and aim for your landing point. Stall performance is excellent due to large amounts of wing area and low wing loading.

PILOT DEBRIEFING

I was really happy with how the plane performed aerobatics: slow rolls, point rolls, rolling circles, harrier, harrier rolls—the list is endless! I can't wait to get even more stick time and see what I can really do with this plane.

BOTTOM LINE

Construction time will vary depending on the skill level of the modeler. I was able to complete the Viking in about four days. During this time, I probably spent between three and five hours per day in the shop. The assembly methods used are common and could be considered easy. With the size and power of this model, however, all steps are critical. My recommendation is to take your time and enjoy! +



Always be sure to check your prop bolts each trip to the field.

HOW TO

Build It Right

OUR TECHNIQUES MAKE ASSEMBLING AN ARF EASY AND FUN

BY **GERRY YARRISH**

Taking an airplane out of the box for the first time can be a little intimidating. But knowing the basics makes assembling an ARF easy.

A nice step up from basic high-wing trainers, low-wing sport fliers are an excellent choice for future development of your piloting skills and learning more advanced maneuvers. With this article, we're starting a building series specifically intended for the newcomer. Let's see just how easy it is to assemble an almost-ready-to-fly (ARF) sport plane.

BEFORE YOU BEGIN

For our series, we're going to use the Sonic ARF from Phoenix Model. With a wingspan of just under 53 inches, the Sonic is a .25-size 4-channel sport design that comes with almost everything you need. Some accessories are required to get it flight ready, and you'll need just a few basic hand tools to put it together. Some hobby adhesives are also required.

This airplane is designed to use either electric power or a glow engine, and for this project, we've chosen to go with a glow engine. All the hardware to install either power system is included in the box. Compared to electric power, a two-stroke glow engine is a slightly less expensive approach and remains the traditional power system. Glow engines do needed accessories to start and run them, and we'll cover that in a future installment of this series.

The Sonic comes completely finished in a wrinkle-free film covering, and all the control surfaces come already hinged in place. Instead of using fabric glue—installed hinges, the Sonic features good-quality, molded plastic hinges with metal hingepins. The hinges are also cross-pinned for a bulletproof installation that will never pull out.

A great feature about the Sonic is that all the hinges come factory installed and are cross-pinned for a strong installation.

All the hardware and screws needed are included.

Here are the basic tools and supplies you need to build this ARF airplane. You'll also need an electric drill and various drill bits. Zap adhesives will be used throughout the build.

For this airplane, we will be installing an O.S. .25 glow engine.

RADIO GEAR

With most ARF airplanes, you need to supply your own radio gear, and for this build, we've selected a Tactic TTX650 6-channel programmable transmitter and the TR625 6-channel Tactic SLT receiver. Any brand of radio gear can be used. For the servos (five are required), we're using Tactic TSX35 standard-size sport servos. Since we are using a glow engine, we do not have a flight battery pack to tap into in order to supply the receiver. So a separate battery pack is required, along with a basic switch harness that allows the pack to be charged without removing it from the model. We chose a 4.8V 2000mAh HydriMax Ultra NiMH pack; it works nicely and fits easily into place. The Sonic comes with all the pushrod and clevis and control-horn linkage hardware, so it is easy to install and connect your servos to the control surfaces.

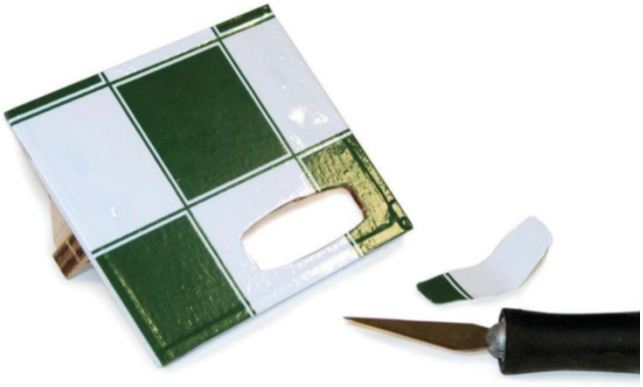
Tactic radio gear will be used to control the finished airplane.

TECH TIP

To make it a bit easier to work on the model after it has been assembled, add 6-inch servo wire extensions to the aileron servo leads and then plug them into a compatible Y-harness lead into the receiver. This will allow the wing to be attached and removed easily, and the extra wire lengths will prevent them from becoming unplugged.

BASIC HARDWARE

Again, all the hardware to assemble the model and get it ready for its first flight is included. This includes formed music-wire landing gear with a steerable nosewheel, the fuel tank and tank plumbing, wheels, control horns, clevises, engine mount, spinner and backplate, wing-joiner tube, nylon attachment screws, and all the required attachment screws. Also included are the parts required for installing an electric power system.



1. Assembly starts by removing the aileron-servo hatch and cutting away the covering over the opening.

GETTING STARTED

After you open the box and take all the goodies out, the first thing you should do is sit down and read the instruction manual thoroughly. Study it and be sure you understand what to do before actually starting your new project. If you are unsure about something, ask an experienced friend or the guy at the hobby shop who sold you the airplane. Then gather the tools needed for the job. These are a hobby knife and a few spare blades, a Phillips screwdriver, a pair of pliers, and a tape measure or ruler. For supplies, you'll need some 15- or 20-minute epoxy and mixing cups, some CA glue, and spray accelerator. I used Zap adhesives for this article.

The assembly starts with the wing panels, and the first step is to remove the aileron-servo hatch covers and cut away the covering from the servo-arm openings. Once this is done, install the servo and attach it to the underside of the hatch cover.

At this point, you can install the servo arms. Plug the servos into the receiver, and switch on your radio system. This will bring all the servos to their center points. The arms and output shaft have splines, so the arms can be placed in several different positions. Before screwing the arms into place, position them on the output shaft so that they are square (90 degrees) to the servo's centerline.

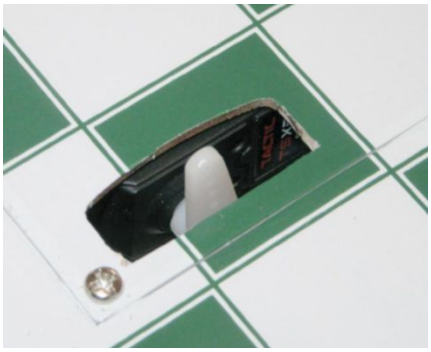
An easy way to install the brass inserts in the servo is to use a small screwdriver and push them into place from the underside of the mounting tab.

TECH TIP

You must always install the rubber grommets and the brass inserts on the servo's attachment tabs so that they can protect the servo from vibration. The brass inserts need to be pressed into place from the underside. Stack four inserts on a thin screwdriver, and push them one at a time into place. The inserts prevent the attachment screws from crushing the grommets while installing the servos. It's a good idea to install all the grommets and brass inserts into all five servos in one sitting.

2. Before attaching the servo arm, you need to center it with your radio.

3. Before screwing the servo into place, you need to trim away some of the material around the servo-arm opening, then the aileron servo is ready to install in the wing.



4. With the hatch cover screwed into place, only the servo arm protrudes from the wing.

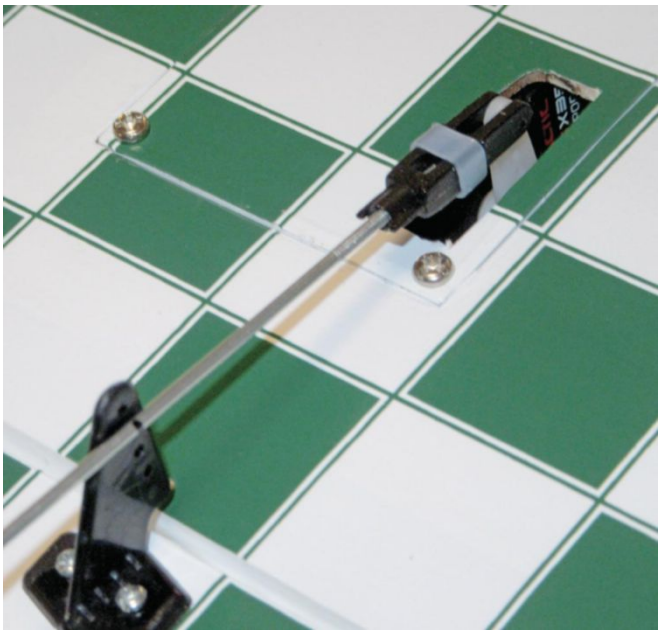
Once the arms are centered, place the aileron servo on the mounting rails on the hatch cover. Check the clearance of the servo arm as it passes through the opening. If you need to, trim away some material so that there's no interference when the servo arm moves. Hold the servo in place, then drill through each of the four attachment holes using a 0.030-inch (1/32-inch) drill bit. Drill all the way through the attachment rails. Remove the servo, clean away any debris, then apply a drop of thin CA in each of the holes. This will coat and "harden" the inside of the holes to strengthen them so that the attachment screws thread solidly into place.

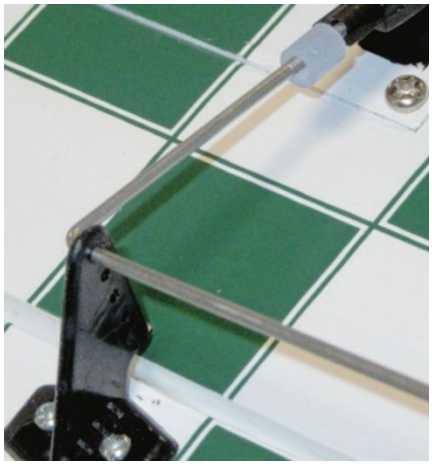
5. The hardware package includes everything for the aileron control linkage shown here.

6. When you install the aileron control horn, make sure the holes in the horn are positioned directly over the hinge line.

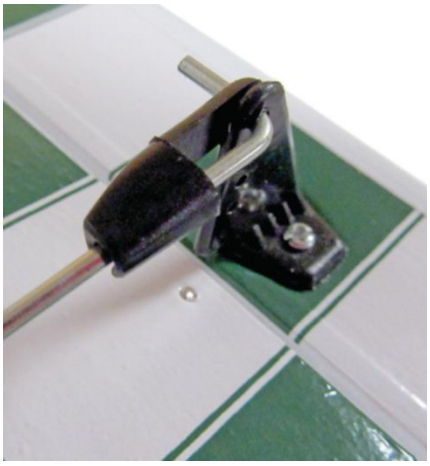
7. (Above) The screws that hold the control horn in place go all the way through the aileron and screw into a back-plate to hold everything securely.

8. (Right) Here, the pushrod has been marked for length.

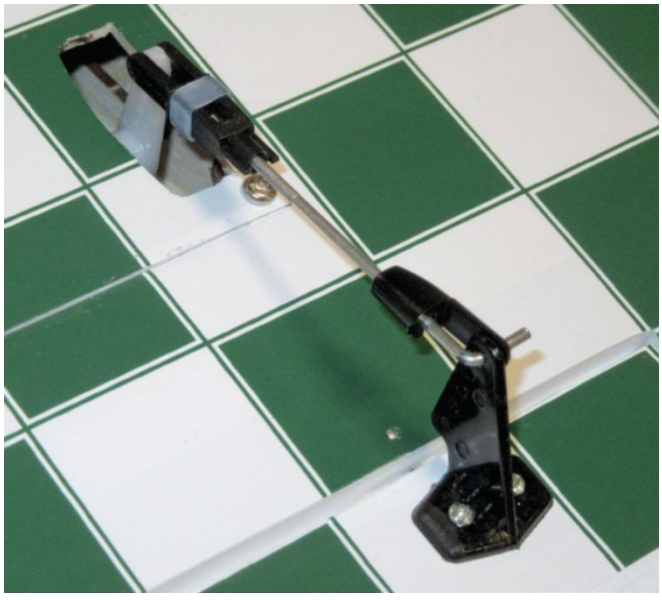




9. The wire pushrod is bent 90 degrees so that it slips into the top hole in the horn.



10. After cutting the wire to length, the linkage is secured with a molded keeper that snaps into place.



11. Here, the completed aileron linkage is shown. Notice the clevis has a length of silicone tubing slipped over it to secure it.

The wing panels are joined together and supported with this aluminum joiner tube.

WING ASSEMBLY

Feed the servo lead through the hatch opening, and guide it through the opening in the top of the wing. You will have to cut away the covering to expose the hole. Place the servo hatch cover in the hatch opening, and use four small 2mm x 12mm screws from the hardware package to secure it in place. Use a piece of masking tape to secure the servo lead so that it doesn't slip back into the wing opening. Do the same for the other wing panel.

Before joining the wing panels together, it is a lot easier to install the aileron control horns and linkages now before the wing is one long part. Each aileron has a control horn, and it is screwed into place on the bottom surface. Place the control horn on the aileron so that the holes in the arm are directly over the hinge line. The horn should be positioned so that the linkage makes a straight line from the horn to the servo arm. Use a fine-tip pen to mark the aileron through the holes in the base of the control horn. Use a 1/16-inch drill bit to drill the two screw holes all the way through the aileron, making sure the holes are straight and square to the control surface. Insert the screws into the horn base and slip them through the holes, then place the backplate over the tips of the screws. Tighten the screws until the plate is pulled tightly onto the top of aileron and the horn is snug and doesn't move.

To join the wing halves together, simply slip the aluminum wing-joiner tube into place, mix up some epoxy, apply to the root rib, and slide the second wing panel into place. Clean away any epoxy drips using some rubbing alcohol and a paper towel, and tape the two wing panels together until the epoxy has cured. Make sure that the trailing edges and leading edges of each panel align properly.

TECH TIP

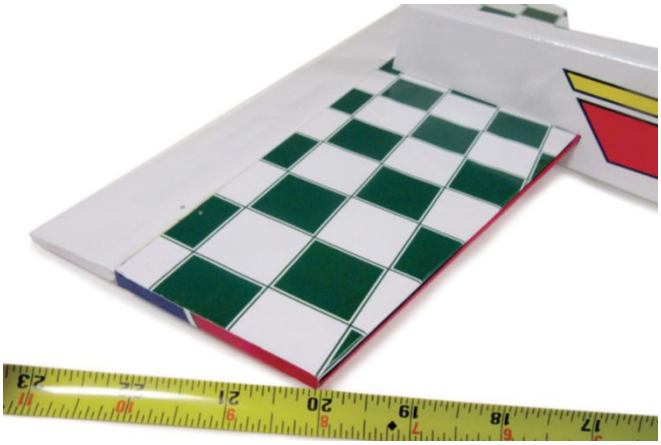
Use disposable cups to mix equal parts of the epoxy together. (Save those small condiment cups and wooden coffee stirrers you get at your local fast-food joint; they are perfect for the job.) To mix equal parts of part A and part B epoxy, squeeze out small bead lines on the bottom of the cup in an X pattern. Count how many lines you add to the cup, then add the same amount of the second part of the adhesive. The ratio is 1:1, but it doesn't need to be exact. When your parts are ready to glue together, mix the epoxy completely and apply it to the parts with the mixing stick.

Epoxy is used to glue the two wing panels together.

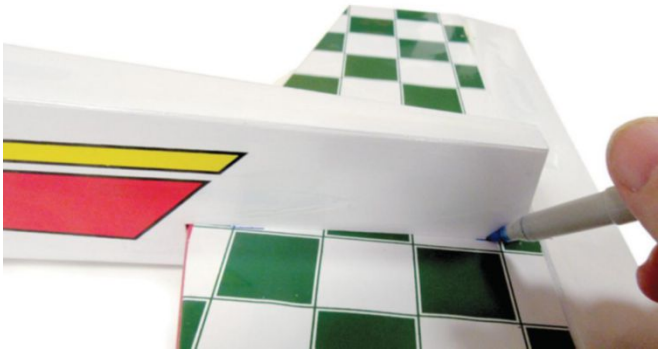
TAIL FEATHERS

Cut away the covering film over the slots in the tail of the fuselage. Slide the horizontal stabilizer into place and measure from side to side, making sure it is centered in the tail. Next measure from the back edge of the wing-saddle area to the front corners of the stabilizer. Tweak the stabilizer's position until the measurements are the same on both sides. Now use a fine-tip marker to draw some guidelines on both sides where the stabilizer exits the fuselage. Slide the vertical stabilizer into the top slot, and repeat the same steps. Remove the surfaces. Using a straightedge, cut away the covering in the inside of the marks. Cut the covering slightly inside each of the marks so that no exposed wood shows when the surfaces are reinserted into the slots.

Mix up another batch of epoxy, and apply the adhesive sparingly to the inner surfaces in the tail slots. Slide the horizontal stabilizer into place and position it with the guidelines, then insert the vertical fin into the top slot. Use some rubbing alcohol and a paper towel to clean up any epoxy that squeezes out of the slots; this will also remove the guidelines. Set the fuselage aside until the adhesive cures.



1. When installing the tail feathers, you must measure the control surfaces' position to make sure they are properly aligned with the fuselage.

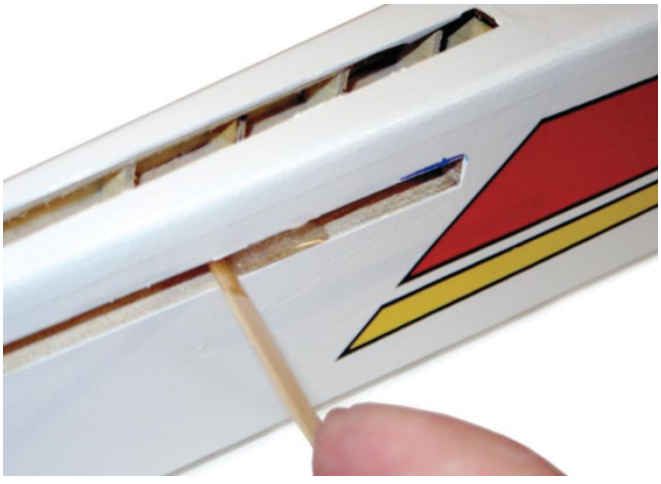


2. Mark the horizontal control stabilizer where it exits the fuselage so that you can cut away the covering where needed.

3. Do the same thing for the vertical fin and rudder.

4. Here, you see the covering removed from the base of the vertical fin.

5. Here, both the horizontal and vertical stabilizers are ready to glue into place.



6. Using a wooden coffee stirrer, apply epoxy to the inside of the slots.

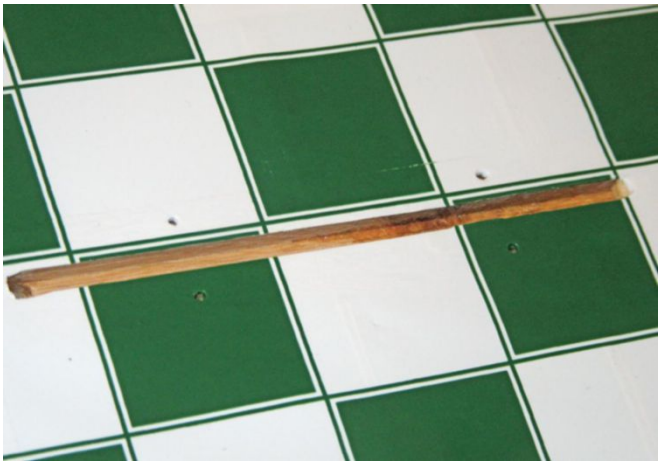
7. Slide the surfaces into place, and wipe away any excess epoxy using alcohol and a paper towel.

LANDING GEAR

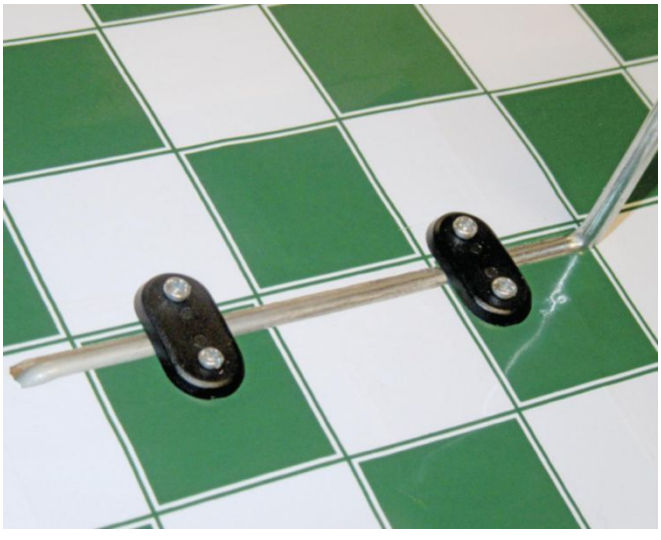
There are two slotted hardwood landing-gear blocks built into the wing, and you have to cut away the covering to expose the slot that fits the music-wire landing gear. Two plastic straps are screwed in to hold the landing gear in place. There are also small pilot holes already drilled in the gear blocks, so you'll have to look closely to find them. Two screws each hold the straps in place.

The wheels are held in place and positioned on the axles with lock collars. Slip the inner collar into place, and tighten the screw; slip the wheel in place, add the outer collar, and tighten its screw. Be sure there is enough clearance so that the wheel spins freely.

Once the main landing gear is in place, you can attach the wing to the fuselage. There are two large nylon screws used to secure the wing in place. Two alignment dowels protruding from the leading edge align and hold the front of the wing in place. There are two holes in the aft section of the wing, and you cut away the covering to expose them. Also, the model comes with a plywood plate that is glued to the bottom of the wing to prevent the screw heads from digging into the wing sheeting. Position the plate so that the holes align with the holes in the wing, then trace around the plate. Remove the covering from the wing and the underside of the plate, insert the two screws into the plate, apply a small amount of CA around the perimeter, and position the plate while inserting the screws through the wing and into the threaded receptacles in the fuselage. Tighten the screws until they hold the plate flat against the wing, and let the glue dry.



1. Here is the slotted landing-gear block built into the wing. Notice the screw holes are already drilled.

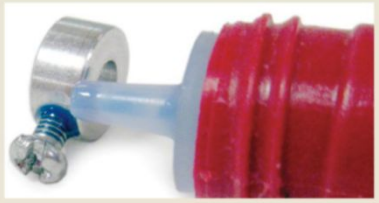


2. The main landing gear are held in place with these screw-on hold-down straps.

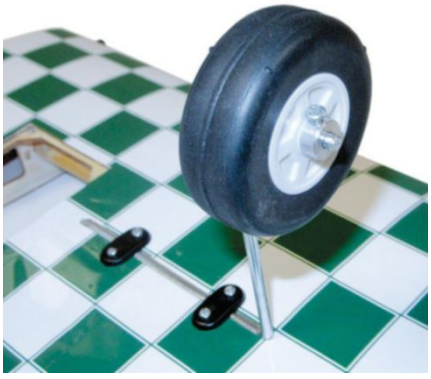
TECH TIP

No one likes losing a wheel during flight. To prevent the lock collars from coming loose, use either a flat file or a Dremel Moto-Tool to grind small flat areas in the axle where the lock-collar screws will sit. This increases the contact area for the screw and prevents the collar from turning on the axle wire. Also, use some Zap blue thread-lock to make sure the screws stay tight.

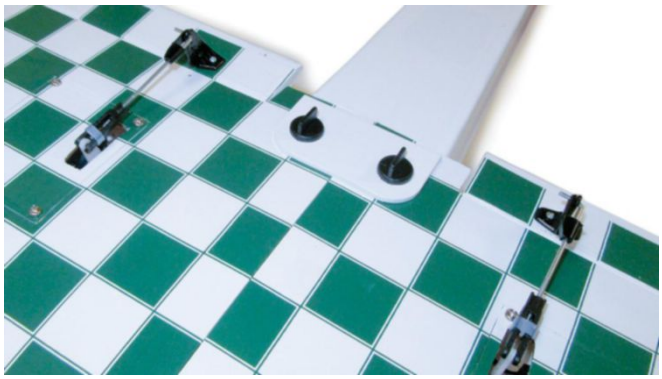
Here, you see the two flat spots ground into the wire axle. These seat the lock-collar screws.



Use a small drop of thread-lock to prevent the screws from coming out of the lock collars.



3. **The completed landing gear is shown with the wheel installed.**



This shows the wing secured to the fuselage with the two molded nylon attachment screws.

NOSE GEAR

Install the nose gear and control linkage. The model comes with the nose-gear attachment bracket already installed on the fuselage. Take one of the music-wire pushrods with the Z-bend on one end, and attach it to the steering arm; you simply slip it into the outer hole in the arm. Feed the pushrod into the plastic guide tube to the right of the attachment bracket, and insert the center of the control horn into the bracket. Insert the music-wire nose gear into the bottom of the bracket, through the control arm, and into the upper part of the bracket. There is a notch ground into the music wire, and it should be positioned under the screw that tightens the arm into place. Use a large Phillips screwdriver and tighten the screw. (Do not add any thread-lock to this screw; it can damage the molded plastic that the attachment bracket is made of.) Install the nosewheel with the two lock collars as you did for the main gear.

That's it for this portion of the build. Next time, we will continue the project and install the O.S. Max .25 FX engine and fuel tank; we will also complete the radio-gear installation. Building a sport flier ARF is easy indeed if you know the basics. Why not give it a try? If you have any questions regarding our Phoenix Sonic project, email us at MAN@AirAge.com. We'd love to hear from you.

4. **The fuselage comes with the nose-gear attachment bracket already installed.**

5. **Here, the nose gear has been installed in the attachment bracket. Notice the steering-control wire is also installed on the end of the steering arm.**

6. **Installing the nosewheel completes the nose-gear installation.**

Be sure to check out our next installment for this project. We will be installing the radio gear and the engine.

FMS A-10 Thunderbolt II PNP 70mm EDF

Blazing speed in a ready-to-fly package

BY **ANDREW GRIFFITH** PHOTOS BY **ANDREW GRIFFITH & ADAM STRONG**

FMS has a wide variety of models but has really upped the ante for jet jockeys with the introduction of the Fairchild Republic A-10 Thunderbolt II. The FMS A-10 PNP (or Plug and Play) includes nearly everything you need to get airborne; you only need to add your favorite 6-channel receiver and a 6S flight battery. The Hog is constructed of high-density foam painted in a flat military gray and is reinforced with plastic where required for additional strength.

AT A GLANCE

MODEL
FMS A-10 Thunderbolt II PNP Twin 70mm EDF

MANUFACTURER
Force RC (forcerc.com)

WINGSPAN
59.1 in.

PILOT SKILL LEVEL
intermediate

ASSEMBLY TIME
Less than 1 hour

RADIO REQ'D
6-channel

BATTERY REQ'D
6S 5000mAh 45C

PRICE
$439.99

WHAT WE LIKE

- Amazing surface detail
- CNC-machined landing gear
- Twin 70mm 12-blade fan sounds like a turbine
- Multiconnectors on each wing make assembly a snap

After binding to a DX18 and a final balance check, the FMS A–10 is ready for its first flight. This is a great–size model because it flies like a larger model yet can be transported fully assembled in many sport utility vehicles.

LOOKING OVER THE FMS A-10, YOU CAN'T HELP BUT BE IMPRESSED BY THE LEVEL OF PANEL-LINE AND RIVET DETAIL PRESENT EVERYWHERE ON THE MODEL.

GEAR USED

RADIO
Spektrum DX18 G2 w/ AR6600T DSMX telemetry receiver (spektrumrc.com); nine included servos (five 9g, four 17g digital metal gear)

MOTORS
Inrunner BL2680 1850Kv brushless motors w/ two 12-blade 70mm fans and two 70-amp BL speed controls (installed)

BATTERY
Venom 6S 5000mAh 50C LiPo (venompower.com)

The wings feature flaps, retracts, and an LED lighting system that attach to the fuselage in one handy multifunctional plug. Twin inrunner motors and pair of 70-amp speed controls provide power. Despite being equipped with nine servos, lights, and three electric retract units, everything plugs into a central control board so that the A-10 doesn't require a fancy radio system with mixing or sequencers to operate everything. While the FMS A-10 is easy to assemble, it's a high-performance ducted-fan twin that is intended for more experienced pilots.

UNIQUE FEATURES

The FMS A-10 comes with most of the hard work completed for you. The motors, speed controls, servos, and retractable landing gear are already installed. The control surfaces are all hinged and the pushrods assembled and connected. The plastic reinforced hinging method used on the ailerons, elevators, and flap surfaces appears to be a serious upgrade over the standard foam hinge lines found on many similar models.

Speaking of plastic, the FMS A-10 appears to be beefed up in all the right places that pick up hangar rash on many models. At the wing root, on both the fuselage and wing sides, is a large plastic reinforcement that supports the two composite wing rods as well as the four wing retention bolts. In addition to the wing rods, there is what appears to be a G10 fiberglass spar that runs nearly the entire length of the outer wing panel to prevent the dreaded wing flex present in foam planes with longer

Venom 6S 5000mAh packs fit perfectly and gave three- to four-minute flights. Most of my flying was done at just above half throttle with a few mandatory full-throttle low passes per flight. The large hatch provides excellent access to change batteries.

The main wings feature a plug-in connector that takes care of servos, retracts, and lighting, making field assembly and breakdown extremely easy.

Gear Up!

The included and installed landing gear are really something to behold. They are electrically actuated and incorporate overcurrent protection as well as functional Oleo struts, which replicate the scissor design of the main gear on the full-size Thunderbolt. The front landing gear incorporates an operational gear door, and the main gear feature split-style fixed doors just like the real thing. Even the bright landing light on the front landing-gear strut lights up when the gear is extended and shuts off as the gear retracts. Topping off the high-quality landing-gear set, the wheels are supported by ball bearings and spin for a long time when given a causal flick.

The machined-aluminum landing gear has proven to be quite robust. The functional LED landing light illuminates when the gear is extended and turns off when retracted. The lighting system adds visual "pop" to the A-10.

wingspans. Also the servo hatches, nose cone, vertical stabilizer mounts, canopy hatch area, and the thin trailing edge of the wing at the root fillet are all plastic.

Looking over the FMS A-10, you can't help but be impressed by the level of panel-line and rivet detail present everywhere on the model. The control horns and ball links are all molded in gray to match the paint, a feature that stands out by not standing out like color mismatched hardware often does. A pilot figure, ejection seat, and instrument panel are all faithfully reproduced as is the signature feature of the A-10: the GAU-8 Avenger 30mm Gatling gun. A detachable set of bombs, missiles, and rocket launchers is provided to round out the appearance so that you can fly it either "clean" or "armed to the teeth."

IN THE AIR

The A-10, like many EDF models this size, appears best suited to operate off of paved surfaces. That said, I've flown the A-10 from closely mowed and rolled grass and didn't have any problems, but rougher fields might be more challenging. Takeoffs were accomplished using 15 degrees of flaps and smooth application of power; the A-10 lifted off after about 150 feet and climbed with authority. Tracking and control during taxi and the takeoff run were positive.

Due to the landing-gear door configuration on the Warthog, extending the landing gear results in about 10 square inches of airbrakes opening into the slipstream. The large flaps are effective and, when deployed at an appropriate airspeed, induce very little pitch change. Rare is a model with this much flap area that doesn't need some elevator compensation!

The combination of drag and the optional ordnance package results in the A-10 needing to be flown with a bit of power on its final approach. Once the proper sink rate is established with the throttle, the A-10 will approach the runway slightly nose-high and touch down on the mains light as a feather.

GENERAL FLIGHT PERFORMANCE

Stability: The A-10 is a solid and stable flier. During the weekend we were testing, I was given the ultimate compliment when someone asked me what gyro I was using. None!

Tracking: The A-10 tracks well, and after just a few flights, I quickly gained the confidence to do extremely low strafing passes, pulling out and coming around for another run. Turns look best when done using a bit of coordinated rudder, and the dual rudders on the A-10 are quite effective.

Aerobatics: The A-10 does what is expected of a scale jet and duplicates the full-scale performance envelope of its big brother. Rolls, loops, split-Ss, and high-G turns are all easy to do, and the Warthog showed no nasty habits.

Glide and stall performance: Keep the nose down and the A-10 will come in power off and float well for a jet. It stalls at a much lower airspeed than I anticipated; it dropped its nose and resumed flying as soon as the elevator was relaxed and power reapplied.

PILOT DEBRIEFING

The A-10 is a scale jet and performs best when flown as such. Removing the ordnance package makes it visibly faster, but even so, if blazing speed is your thing, the A-10 may not be for you.

BOTTOM LINE

The FMS A-10 arrived extremely well packed in its interlocking foam shipping container. Total assembly time is less than one hour. A 2mm metric driver or Allen wrench is used to fix the provided screws that hold the rudders, the tail assembly, and the wings in place. Installation of an AR6600T integrated telemetry receiver was completed and bound to my DX-18. Control throws and center of gravity were set per the manual, and I added a three-second delay to the flap deployment. My speed controls required programming to calibrate the throttle channels and disable the brake function. ✚

Half-Scale Triplane

Master builder and flier goes really big

BY **GERRY YARRISH** PHOTOS BY **SHARON HOLLAND**

Many scale modelers who've competed at Top Gun know Bill Holland as the chief judge for the impressive scale invitational, but Bill is also an accomplished and experienced scale model builder and flier in his own right. His newest project is this amazing 50 percent scale Fokker Dr.1 Triplane, and it is a work of RC art! Let's take a closer look.

MAKING BIG EVEN BIGGER

The story of this build actually started during Dawn Patrol 2011 in Dayton, Ohio, where Bill was talking World War I scale with Glenn Torrance. Bill wanted something grand, so he enlarged a set of Glenn Torrance Models 1/3-scale plans for the Fokker Triplane, increasing them to half scale. Along the way, Glenn helped the project by providing a short kit of ribs as well as an engine cowl and other metal components.

A Glenn Torrance Models design, the structure and method of construction is very scale. Half-inch-diameter, 8-foot-long poplar dowels are used for the metal tube structure of the fuselage, and there's scale internal cable reinforcement used just like the full-size airplane. That's 140 feet of 3/64 braided wire with 40 turnbuckles in the fuselage. The wings are built around strong box spars, and the ribs have a scale under-camber airfoil shape and have upper and lower cap strips. The leading edge is formed with thin plywood sheeting, and the trailing edges are formed with braider (19-gauge) steel cable wire. Sheet aluminum is used to make the scale panels, which give the aircraft its characteristic shape, and the tail surfaces are made with a combination of laminated wood, dowels, and carbon-fiber tubes.

All of the strap hinging is scale and homemade from sheet metal and brass tubes. All of the control surfaces use scale cable pull-pull setups, and Bill made the wheels using 16-inch spoked wheels from Tractor Supply. He covered the spokes with Ceconite fabric and painted them to match the finish. The covering is a combination of Poly-Fiber aircraft fabric and 3-ounce Ceconite 102 fabric. Just as it is on the full-size aircraft, the covering is applied to the airframe with Poly-Tak glue, shrunk tight with a covering iron and then painted using the Poly-Tone paint system. The color scheme Bill used is the 425/17 aircraft that was flown by Manfred von Richthofen. This scheme is the original factory paint job. The model's paint includes Poly-Brush sealer coats, a silver Poly Spray UV undercoat, and then the Poly-Tone color paint. Bill also used more than 420 feet of string for the simulated rib stitching

QUICK SPECS

MODEL: Fokker Dr.1
BUILDER: Bill Holland
WINGSPAN: 142.2 in.
LENGTH: 108.7 in.
WEIGHT: 120 lb.
ENGINE: 3W 275cc twin cylinder
PROPELLER: 37x13
RADIO: Futaba 12FG
SERVOS: Four Futaba 9157 and two each Futaba 9156 and 3305
TIME TO BUILD: 2 1/2 years

A half–scale triplane is really a big airplane. Here, Bill Holland shows off his amazing project.

The all-wood triplane uses scalelike construction and building techniques.

and made the Spandau machine guns by modifying half-scale Balsa USA kits. He went the extra mile by adding all the scale cockpit interior details and full instrumentation. The one-of-a-kind pilot has a custom head by Lyle Vasser of Best Pilots that was 3D-printed using actual photos of von Richthofen. Lyle consulted with family members to verify the resemblance and accuracy. An inner skeleton was made to scale with PVC pipes, and Bill's wife Sharon filled out the body and stitched all the clothing, including the leather flying helmet and jacket. In all, the half-scale Fokker Triplane took Bill two and a half years to complete.

Top left: For a giant-scale airplane of this size, details like this fully executed cockpit interior are an absolute must. Left: The dummy radial engine was also scratch-built. Above: The custom-made half-scale pilot figure has a 3D-printed face that is a realistic copy of the Red Baron himself.

BY **CLARENCE LEE**

Keeping Powerplants Running Right

[Q&A] Email your questions to Clarence Lee at MAN@airage.com.

As many of you probably know by now, Fox Manufacturing went out of business this past summer, and this came as quite a shock to many Fox owners as well as the hobby industry in general. Fox was one of the oldest and largest model engine manufacturers in the United States, after starting business in 1948 out of a garage making the Fox 35. Prior to this, Duke Fox had designed the Fox 59, which was manufactured by the Claude C. Slate Co. and first sold in 1947. Duke later took over production and made the engine in his own shop. As the business grew, he set up shop in North Hollywood, California, and took on Dale Arnold as a financial partner. The company became known as Arnold & Fox. Other engines were added to the lineup, but Duke always referred to the 35 as his "bread and butter" engine. Then in the summer of 1951, Lew Andrews won the control-line stunt championships at the U.S. Nationals using a Fox 35, and sales zoomed beyond Duke's wildest expectations. I remember him telling me that in just a couple of months, sales of the engine exceeded $50,000, which was quite a bit of money back in those days—especially when you consider the engine sold for only $35. Duke marketed his engines through quite a few distributors. Although many of the hobby-related manufacturers are going direct to the discount houses, eliminating the distributor, I am sure that some of those left may still have a supply of parts in their inventory. If any of our readers know of a source of parts for Fox engines, please let us know.

Back in the June column, I asked if any of our readers knew of a source of Quadra engine parts. It has taken a couple of months, but reader Dennis Greene has come through with a source: B&B Specialties (bennettbuilt.com; 575-277-0499). The company has parts and services for both Quadra and Zenoah engines. Thanks for giving us the information, Dennis.

Now to some letters.

REVERSING A FOUR-STROKE?

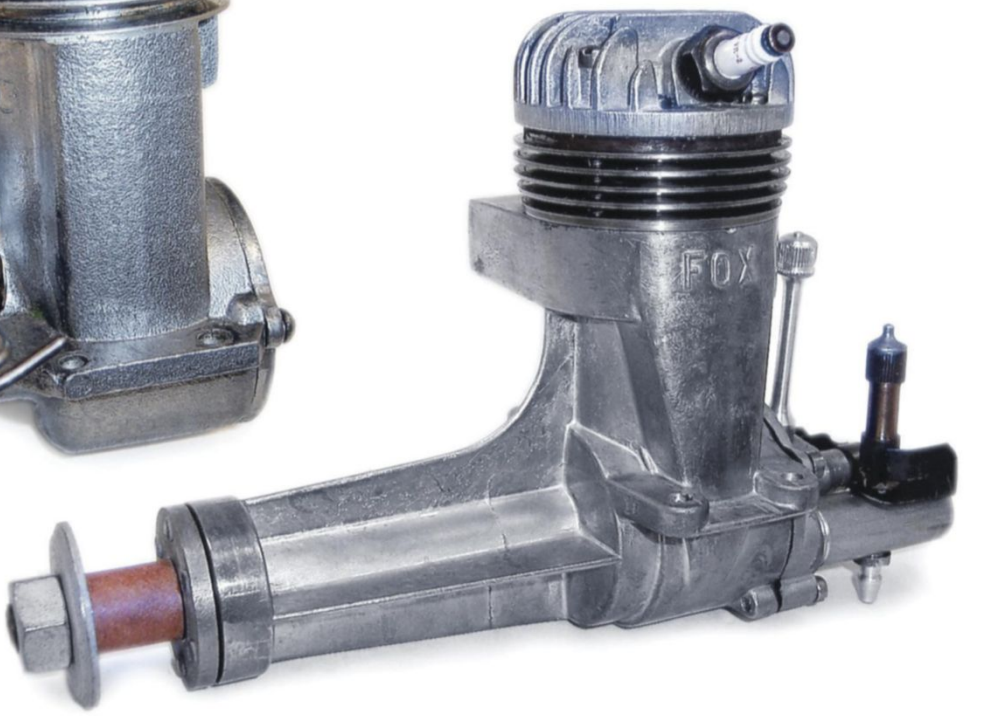
✉ I love your articles on engines. You have answered many of my questions asked by others, and I have learned a lot from you. Can I make an O.S. four-stroke run backward by just retiming it? My Enya engines are easy with their two separate cams, but can O.S. engines simply be "retuned" to run backward? I want to build a twin pusher and would like the wide range of choices of tractor props, instead of a possible compromise with the available pusher props in the marketplace.—*Mike K.*

Answer: Mike, I'm afraid you are out of luck with reversing the direction of rotation on the O.S. engines. The position of the intake and exhaust valves would have to be reversed (i.e., the intake needs to open ahead of the exhaust). Although I have never tried it, I don't see any reason why this could not be done with an Enya with its separate intake and exhaust cams. Thanks for the kind words regarding the column. It helps to make up for some of less-than-friendly letters I receive occasionally when I step on someone's toes.

VARIABLE VENTURI

✉ I recently purchased two K&B .61s on eBay. One had a Perry carburetor and the other a strange carburetor with the intake on the side. Do you know anything about this carburetor, and did it originally come on

The original Fox 35 built by Duke Fox was a popular engine for control-line stunt flying, and it was noted for having a soft break going from a four-cycle to a two-cycle mixture setting.



The 1947 Fox 59 designed by Duke Fox was manufactured by Claude C. Slate Co., in Los Angeles, California. It was available with both a lapped piston (high torque) and a ringed piston (high speed). The engine weighed only 9 1/2 ounces and developed 1 horsepower, giving it the highest power-to-weight ratio of any post–WW II model engine.

The unusual M&H carburetor with the air intake on the side rather than on the top worked very well but presented a problem with choking to start the engine.

the engine? I ran the engine, and it has a very low smooth idle with almost instant acceleration.—*Douglas Weaver, Williamsville, NY*

Answer: I sure do, Doug, and no, the carburetor did not come on the .61; it was an aftermarket item. The carburetor was known as the M&H Variable Venturi Carburetor, and it was designed by Carl Hammons and manufactured by Joe Martin, who manufactured the Sherline benchtop lathes and milling machines. Joe was also the founder of the Craftsmanship Museum in Carlsbad, California. (If you want to see some fantastic work done by different individuals, check out craftsmanshipmuseum.com.) Carl Hammons, in conjunction with Roger Theobald, designed the Kraft .61 prior to going to work for Joe Martin. Joe passed on a couple of years ago, preceded by Carl, but the Craftsmanship Museum in still in operation and open to visitors.

As you found out, the carburetor worked out very well, but it did have one fault. With the air intake on the side, it could not be choked for starting unless the engine was equipped with a muffler that pressurized the fuel tank. Then just placing your thumb over the muffler tailpipe and flipping the prop would force fuel to the carburetor.

BAD VIBRATIONS

✉ I bought a K&B .61 CL special new and in the box at a flea market and had you upgrade it in February 1994. The engine runs fantastically well and is installed in my own plans-built Phil Kraft Kwik-Fli Mk III. However, I have noticed that it vibrates more than any engine I've ever run in 30 years of modeling. It is so bad that the last time I flew it, the nose-gear mount screws had backed out of the firewall from the vibration. I am running a well-balanced (on a Robart High Point balancer) APC 11x7 prop and Omega 5% fuel (3 ounces of castor added per gallon). It is mounted on a Sig aluminum motor mount, and the spinner is a 2-inch aluminum one from C. B. Associates. Is there anything I can do to reduce vibration in this engine?—*Carl Grover*

Answer: Carl, without being able to examine your engine, it is pretty hard for me to say why you are experiencing above-normal vibration. The K&B .61 does not vibrate any more than any other .60-size engine and less than some. Back in the mid-1960s when I was developing the engine, I did quite a bit of work determining the proper amount of crankshaft counterbalance weight. It is impossible to balance a single-cylinder two-stroke engine at all rpm ranges. The K&B .61 (then Veco .61) balanced for the smoothest running at the 11,000—12,000rpm range. An 11x7 prop is too small a prop for the engine, and you may be reaching a harmonic vibration point. You should be using an 11x7 3/4 or an 11x8 prop. Try this and see if it doesn't help. Although you have checked the prop for balance, how about runout? Place your aircraft next to your toolbox, with the prop tip just clearing the box, and make a mark. Then rotate the engine 180 degrees and see if the tip is still at the mark. Also, are you sure that the engine has not been involved in a crash that bent the prop stud? This would explain any tip runout if it wasn't due to the prop itself. One final thought: After 22 years, it is possible that one or both bearings may be frozen and skidding rather than rolling. Other than this, I do not know what else to offer. If any of the above solves the problem, please let us know.

By removing the valve cover from this O.S. four-stroke engine, you can see how easy it is to get to the springs.

TIP OF THE MONTH

Weak Valve Springs

Do you have a four-stroke engine that has good compression, starts easily, and idles well but misfires on any maneuver that allows the engine to increase the rpm? If this seems to occur at a lower rpm than when the engine was new, you are experiencing "valve float," my friends. This occurs when the valve opening and closing cannot keep up with the rpm of the engine.

This can only be caused by one of two things: a sticking valve or a weak valve spring. If the engine has good compression, then the problem is caused by a weak valve spring. Remove the rocker cover or covers, and compress the intake valve with your finger and note the pressure required. Then do the same thing with the exhaust valve. If the pressure required to compress it is lower, you have the answer to your problem and should replace the valve spring. The exhaust spring is always the first to weaken due to the exhaust gas heat and not experiencing the cooling effect of the incoming fuel mixture that the intake valve does. This problem is seen more often in the smaller (1.20 and under) displacement size engines due to their smaller springs with less compression pressure.

RPM ISSUES

✉ I have an SM 30cc gas (German-made engine) on a pattern airplane and a Mintor 33cc gas on a Yak 55. Both engines run fine on any throttle setting with unlimited straight-up climbing without losing a bit. My problem is when I do a slow roll or point roll or I fly inverted 3/4 of a throttle, the rpm of both engines drop down (like a fast idle); as soon the plane rolls upright, the power comes up again (the throttle setting is the same throughout the maneuver).

Both engines are installed upside down, and both use 20x7 Melznik carbon props. The fuel tanks are on the each plane's center of gravity. I use a Du-Bro gas fuel filler and an online filter before the carb, and I always filter the fuel when refueling. For the overflow fuel line from the fuel tank, I run the line all around the top of the tank and then exit it on the lower part of the fuselage. (I only use two fuel lines from the tank: one from the clunk to the carb and one from the top of the tank to overboard the fuel when the tank is full.) I have installed a nipple on the breathing hole of each of the engine's Walbro carbs and ran a fuel line from the nipple to a film canister installed midway in the fuselage with a 11/8 hole on the other end (rearward) to stabilize the static pressure. The spark plugs look like the engines run properly: no lean or rich running. I moved the fueling valve from on the top of the fuselage to the side of the fuselage, hoping that having the fueling valve on the same level as the carb might solve my problem, but I had no luck.

I would greatly appreciate any suggestions. By the way, I have been flying pattern and competing since 1978 with O.S. .60, YS 1.40 four-stroke, and Rossi engines installed on my Tiporare, Arrow, and Curare, and all of my engines have always run excellent all these years.
—Denis Sandas, Greece

Answer: Denis, with both engines and different aircraft experiencing the same problem, I think I am safe in saying that you have a fuel tank or installation problem. I am also pretty sure that it isn't a case of the engines going to low idle but, rather, momentarily shutting off and "windmilling," which is a good indication that the engine is sucking air. This was a common problem with the Perry pump on a sharp pull up or turn, which was solved by using muffler pressure in conjunction with the pump. This really upset John Perry, and he recommended using surgical tubing. However, surgical tubing would tie itself in a knot during spins and violent maneuvers. The first thing to check would be the fuel line and clunk in the tank. If it's too stiff or the clunk is too light, it cannot follow the fuel. Hold the tank on its side and see if the clunk falls to the side. Also be sure that the tank is not moving and pinching the fuel where it passes through the firewall or bulkhead. If everything checks out OK, drill and tap the muffler for a pressure fitting and pressurize the fuel tank. Maybe the Walbro carburetors, like the Perry, just need a little extra help.

If you still experience the problem, try using a small secondary two- or three-ounce tank next to the carburetors from which the engines can draw fuel. This is a common practice with jet aircraft to eliminate any air bubbles that can kill the engine. Bob Violett (bvmjets.com) sells a tank just for this purpose.

That wraps up another one. We'll be back in the August issue. ✢

Blade/Horizon Hobby 250 CFX BNF Basic

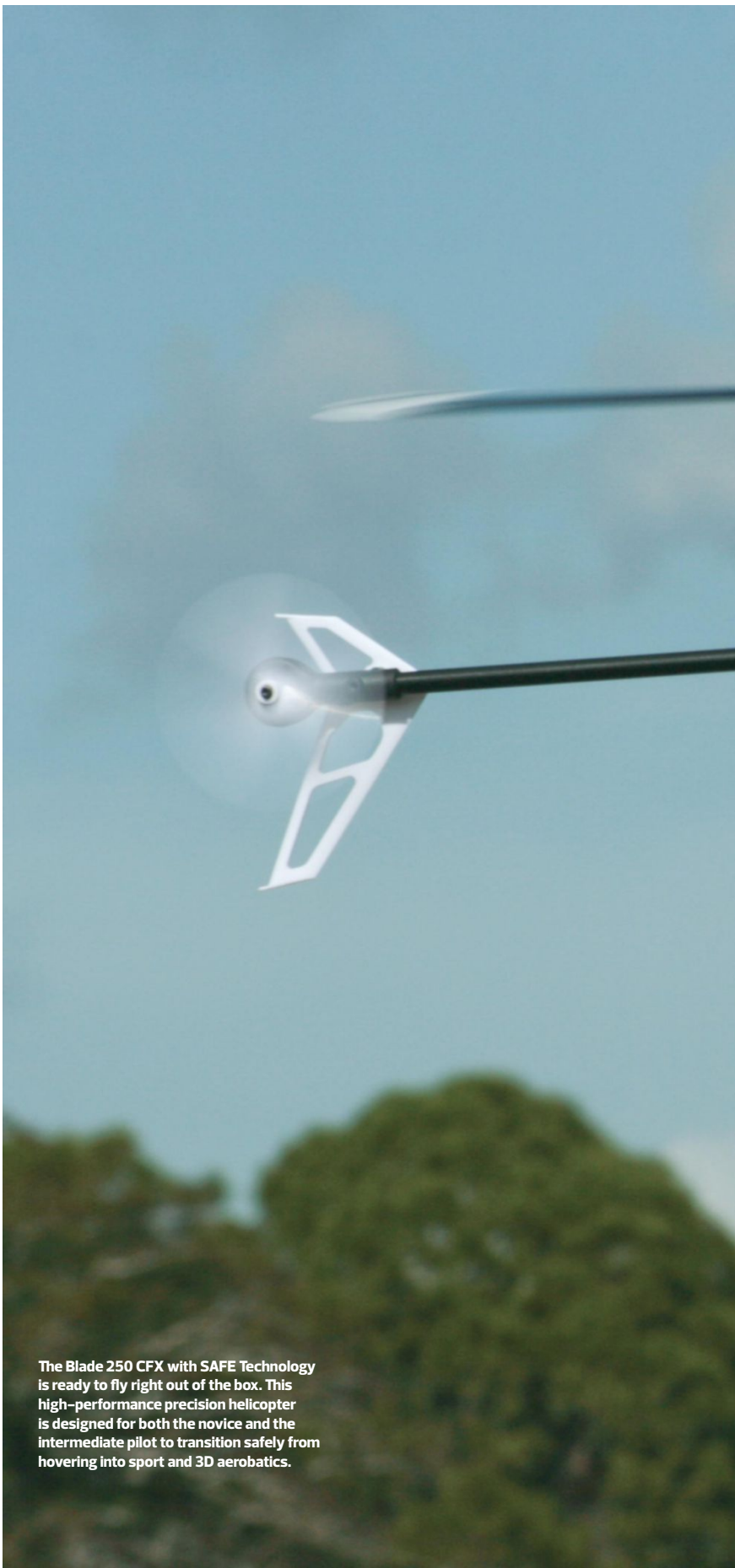
This midsize heli adjusts from mild to wild performance

TEXT & PHOTOS BY **PAUL TRADELIUS**

The new Blade 250 CFX with SAFE Technology has taken all the complications out of flying an RC helicopter. This precision, high-performance 3D helicopter doesn't have the high price tag or intimidating size of a larger helicopter, and its lightweight and durable carbon-fiber frame and rotor blades mean that you'll be flying more than fixing. Strong metal-gear digital servos and powerful brushless motors provide an accurate and responsive feel while flying. Engineered around Horizon Hobby's SAFE Technology, it has a progressive flight-mode system that makes flying a collective-pitch heli comfortable, even if you're a beginner. The Stability mode provides the safety of bank limits and self-leveling, so it's possible to fly with confidence and quickly improve your pilot skills. And when you're ready to progress, the Agility mode opens the flight envelope to explore basic aerobatics, while the 3D mode enables the 250 CFX to perform like a more advanced helicopter.

UNIQUE FEATURES

The Blade 250 CFX is a completely ready-to-fly helicopter right out of the box. Just connect a suitable LiPo battery and bind the receiver to your transmitter. It's called "Bind-N-Fly," or BNF, and getting into the air could not be easier. Although the 250 CFX is designed to get the novice pilot into the air quickly and easily, it's also an excellent aerobatic trainer for the more advanced pilot. The instruction manual also provides many setup tables for the most popular transmitters to take the guesswork out of adjusting the throttle and pitch curves, gyro, dual rates, etc.



The Blade 250 CFX with SAFE Technology is ready to fly right out of the box. This high-performance precision helicopter is designed for both the novice and the intermediate pilot to transition safely from hovering into sport and 3D aerobatics.

IF YOU GET INTO PROBLEMS WHILE FLYING IN ANY MODE, ACTIVATE PANIC RECOVERY AND THE HELICOPTER WILL IMMEDIATELY RETURN TO AN UPRIGHT LEVEL ATTITUDE.

AT A GLANCE

MODEL
Blade 250 CFX BNF Basic helicopter

DISTRIBUTOR
Horizon Hobby (horizonhobby.com)

ROTOR DIAMETER
21.7 in.

PILOT SKILL LEVEL
Novice to advanced

ASSEMBLY TIME
None

POWER REQ'D
3S 1350mAh LiPo

RADIO REQ'D
6-channel DSM2/DSMX-compatible

PRICE
$329.99

WHAT WE LIKE

- Ready to fly out of the box
- SAFE Technology stabilization
- Suitable for novice and intermediate pilots
- Panic Recovery button

GEAR USED

RADIO
Spektrum DX18
(spektrumrc.com)

MOTOR
Brushless 250
(installed)

BATTERY
E-flite 3S
1350mAh LiPo
(e-fliterc.com)

The SAFE (Sensor Assisted Flight Envelope) Technology uses a combination of multi-axis sensors and software, so the helicopter always knows its position relative to the horizon. In Stability mode, the bank angle is limited, and when the cyclic stick is released, the helicopter will return to level flight. In Intermediate mode, however, the bank angle is not limited, so when the cyclic stick is released, the model will not return to level flight. This mode is great for learning forward flight and basic aerobatics, such as stall turns and loops. Agility mode is great for 3D aerobatics, such as stationary flips and tic-tocs, and you can also change rates (control sensitivity) with a two-position switch. Beginners benefit from the use of low rate for initial flights, while the high rate provides full control and is suitable for intermediate and experienced flyers.

If you get into problems while flying in any mode, activate Panic Recovery by pushing and holding the Bind/Panic button and letting go of the control sticks. The helicopter will immediately return to an upright level attitude. This mode really adds confidence to allow you to move on to more advanced maneuvers.

IN THE AIR

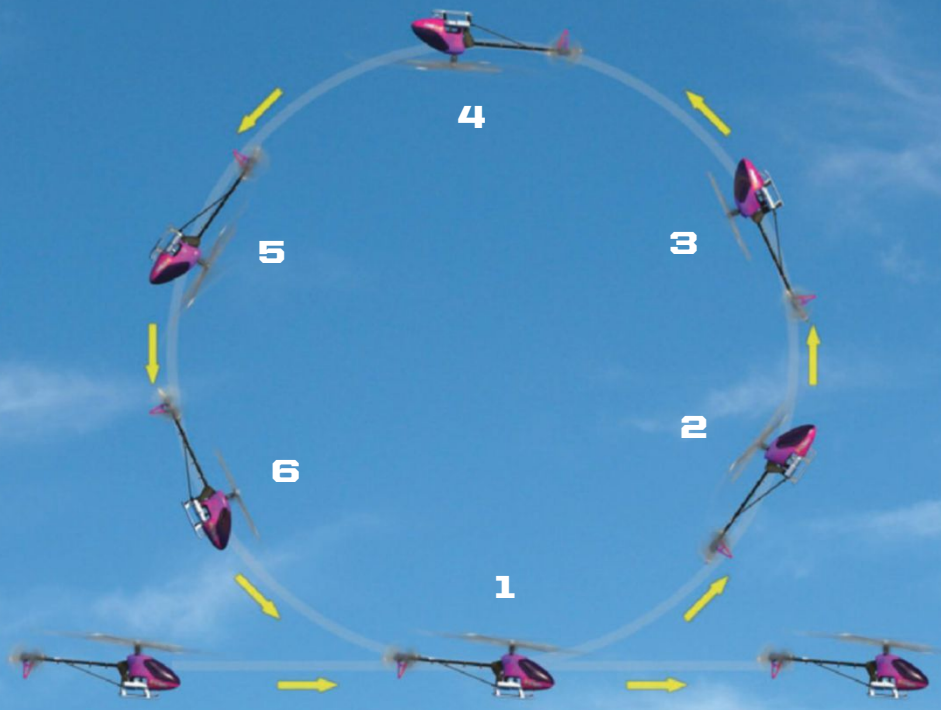
The Blade 250 CFX was ready to fly once a suitable battery was installed and the receiver

The CCPM (cyclic, collective-pitch mixing) swashplate and flybarless rotor head combine light weight and direct connection to the servos for the precision and feel of a much larger helicopter.

The carbon side frames are strong and lightweight, making the Blade 250 CFX an excellent choice for the novice pilot. The brushless motor, battery, and receiver with SAFE Technology are all part of a well-thought-out and compact design.

Fly a Forward Loop

One of the most fundamental maneuvers in a pilot's aerobatic arsenal, this maneuver portrays a perfect vertical circle. It's easier to keep the loop round if you fly into the wind and centered on your position.



Step 1: Fly the model straight and level at medium to high speed to enter the maneuver into the wind. Input a very small amount of aft cyclic when the heli passes directly in front of you.

Step 2: When the heli starts to fly the first part of the loop, input just enough aft cyclic to make a medium loop while adding some throttle for lift. Mentally visualize the rest of the loop.

Step 3: Reduce throttle and aft cyclic to avoid flattening this part of the loop and to keep the speed constant.

Step 4: Throttle should be around midstick if you entered the loop at high speed or a little below if you entered at medium speed. Correct with left/right cyclic to keep the rotor disc level.

Step 5: You may need a little less throttle if you bled off speed at step 4 to keep the back of the loop round.

Step 6: Add throttle and a little aft cyclic to generate more lift and start increasing speed. Exit the loop under power at a normal, slightly nose-down attitude.

The tail rotor uses a unique design. Rather than rob power from the main rotor to drive the tail rotor, an independent brushless motor powers a 3-blade tail rotor. This combines efficiency with the holding power needed for aerobatics.

was bound to the transmitter. The rotor blades were in track, and the cyclic sensitivity and collective pitch settings were suitable for the various flight modes.

Stability mode. Initial flight tests had the SAFE Technology software set to the Stability mode, simulating initial flights by a novice pilot. For most helicopters, this would require setting up the cyclic and collective-pitch functions to reduce helicopter sensitivity as well as installing training gear to the landing skids to prevent tipping the helicopter over during landing. The Stability mode proved to be so stable yet responsive to pilot inputs that no further adjustments or training gear was needed. Well-controlled takeoffs, hovering, and gentle flight maneuvers were possible with minimal effort. New pilots are generally nervous when performing their initial hovering and forward-flight attempts, resulting in the helicopter overbanking into a dangerous position. This tendency was completely eliminated in the Stability mode. Another advantage of this Stability mode is to practice nose-in hovering, where the aileron and elevator cyclic functions are reversed. The novice pilot can now experiment with this type of hovering without endangering the helicopter.

Intermediate and Agility modes. These modes are suitable for the intermediate pilot to progress into aerobatics and then into 3D maneuvers. The Blade 250 CFX has a bright color scheme, making it easy to see in flight, and the overall feel of the helicopter is what you would expect from a much larger model. The Panic mode, used to return the helicopter to level flight with the push of a button, is especially useful when practicing new and more aggressive maneuvers.

PILOT DEBRIEFING

The Blade 250 CFX is the first helicopter I have flown that is ready to fly out of the box, with multiple flight modes to take the pilot from being a novice through aerobatics and into 3D flight maneuvers. The combination of stability, flight performance, and a relatively inexpensive cost make this a perfect first-time helicopter for either the novice or intermediate pilot.

BOTTOM LINE

The Blade 250 CFX is a midsize helicopter that can be flown by the novice flier to safely get into this great hobby and also by the more advanced pilot to transition into sport aerobatics. This helicopter is a combination of quality, durability, precision, and high performance without a high price tag.

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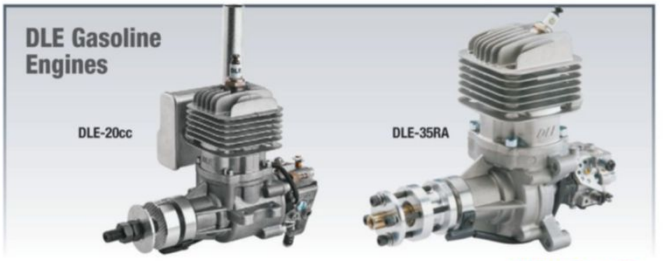

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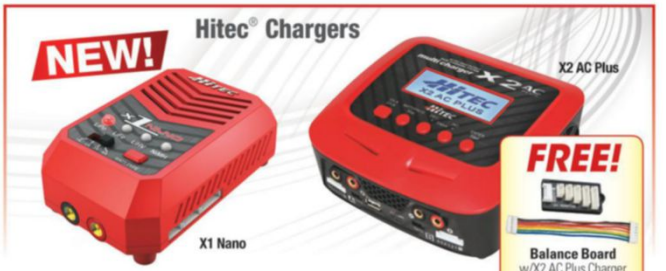

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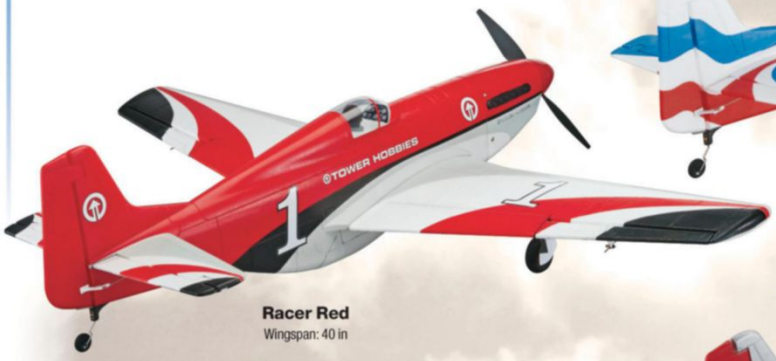

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25 TOP SHOP TIPS

Expert advice makes modeling fun and easy

BY **THE *MODEL AIRPLANE NEWS* CREW**

Over the years here at *Model Airplane News*, we have picked up a number of outstanding tips covering all aspects of our hobby. Here are 25 of our favorites; we hope they make your field and bench time easier and more enjoyable.

Servo Tape

When using double-sided foam servo tape, always clean the servo case with some rubbing alcohol and then apply some clear tape to the case before applying the foam tape. Make sure the surface to which the servo is being attached is clean for a proper bond. If your servo case is dirty and has leftover foam-tape adhesive in it, be sure to clean it before reinstalling the servo. One product you can try for this is Crayon Away (available at Walmart); it works great for removing that leftover tape residue.

IN A SQUEEZE

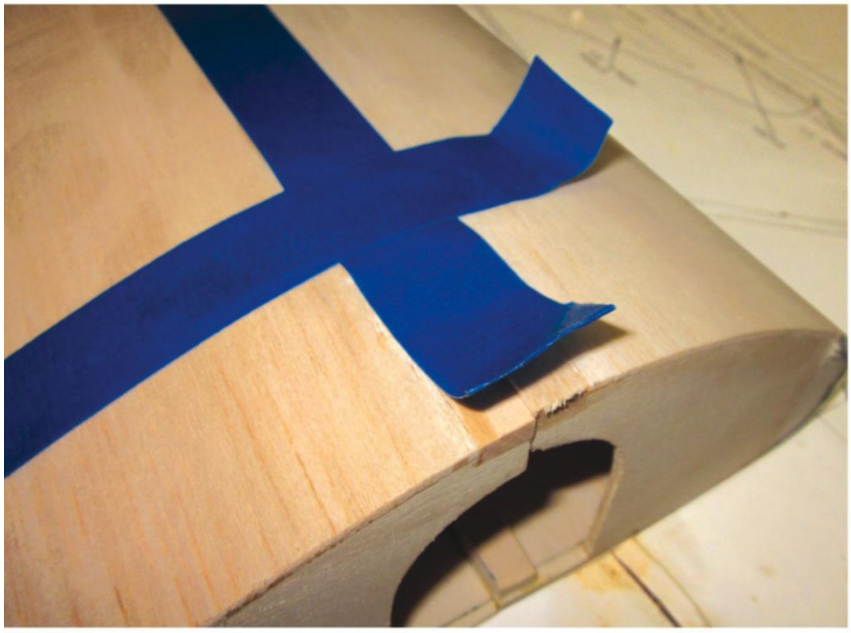
CA glues are sensitive to moisture in the air and can thicken or harden in the bottle. To help prevent the glue from spoiling, squeeze out the air before replacing the cap. This minimizes the amount of air/moisture in the bottle and helps the glue last longer.

Handy Storage

It never fails. You're at the flying field and you need to bind a receiver to your transmitter, but your binding plug is back home on the workbench. Open up your transmitter's battery compartment and drop a spare plug inside. You'll now be bind-ready whenever the need arises.

DOUBLED OVER

When using masking tape to hold parts together while glue is drying or to mask something during painting, always fold over the end of the masking tape. This helps make the removal of the tape after the job a lot easier, and it helps prevent the leaving dents in the soft balsa below from fingernails when trying to peel back the tape.



Bag It!

A common task in the workshop is to cut music-wire pushrods to length with a wire cutter. The scrap piece often flies across the shop or, even worse, can cause injury should it hit someone in the face. A quick and simple remedy is to use a ziplock sandwich bag to capture the piece. If you don't have a sandwich bag handy, place a towel or shop rag over the part before you snip it to length.

Throttle Safety

When you fire up your radio and then turn on your model's receiver, you always want to have the throttle set at the full off (idle) position. This is especially important for electric models. One of the simplest ways to keep that throttle stick in the safe position is to use a rubber band to hold the stick down—easy and safe!

ALL CHARGED UP

When you go to the flying field for the day, you usually bring a few extra battery packs. If you're attending an out-of-town event, then more than likely you'll also be bringing your charger. At the field getting ready for your next flight is not the time to figure out which packs are fully changed and which have already been depleted. Bring a few clothespins with you and attach them to the fully charged packs, then remove them before you install them in the plane. Simple and quick!

25 TOP SHOP TIPS

AWL FOR ONE

For a quick way to make a hole for a screw in balsa, you can use a sharpened awl instead of a small drill bit. Simply push the awl straight into the wood and twist. This works equally as well with light ply. To strengthen the hole, thread the screw into place and then remove it. Add a drop or two of thin CA glue, and replace the screw.

Balance Points

The most important thing you can do to ensure your model flies correctly is to make sure it is balanced properly. A quick and easy way to make a precision balancer for small- to medium-size RC planes is to use a couple of transmitters. Add some soft oversized pencil erasers, and place the model on top of the antennae close to the fuselage. Move the model back and forth until it stays level and you know where the balance point is. Add weight or move equipment around until the plane balances as the instructions dictate. This is a good technique to use in the pits at the flying field.

INTERNAL SWITCH

Here's a simple way to keep the outside of your model looking clean and neat. Instead of cutting a large opening in the side of the fuselage and mounting the radio switch externally, mount the switch internally on a plywood tray and then attach a thin piece of music wire to it. Drill a hole in the switch toggle, and bend a 90-degree L into the end of the wire. Drill a small hole in the fuselage side, slip the wire into the hole in the switch toggle, and use a lock collar to secure it. Add another 90-degree bend on the outer end of the wire and then it will be easy to activate the switch by sliding the wire in and out.

Egg Crating

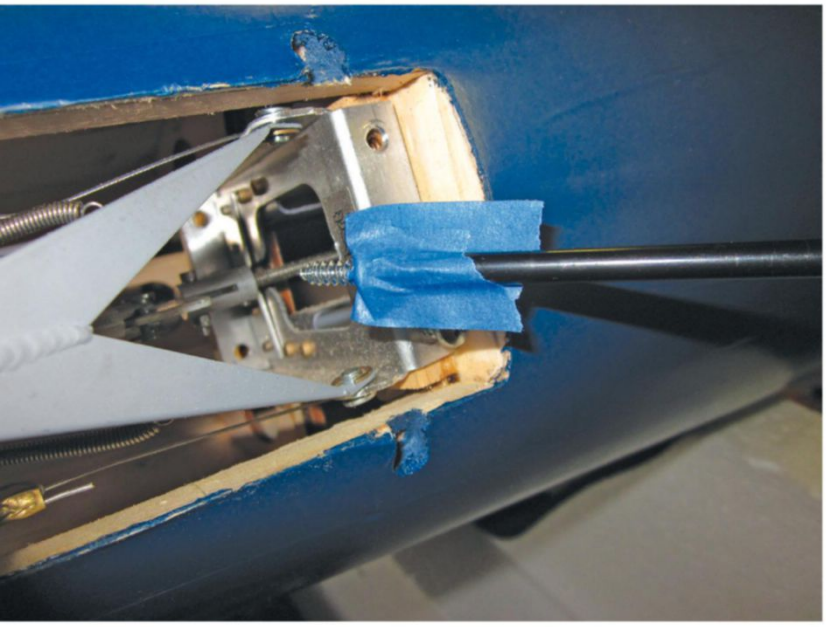
It is frustrating to lose hardware and other small kit parts while building a model airplane. A missing part slows the build, and if you lay your uncovered parts on a stray screw, you instantly catch hangar rash. Keeping your parts and hardware organized is the answer, and the most inexpensive (i.e., free) organizer out there is a dozen-count egg-crate container. It isn't fancy, but it is very effective.

Quick ID

If you have been in the hobby for a while, chances are you have a few radio systems spread over your collection of RC model airplanes. A quick and easy way to choose which radio you need without having to power it up and enter the model-memory menu is to apply a label on the bottom or back of the radio case printed with your model's names and memory numbers. As you change your model memories, you can simply apply a new label.

MAGNETIC SCREWDRIVER

The best way to reach into model airplanes and install servo screws is with a magnetic screwdriver. Of course, you can also make your own simply by placing an inexpensive button magnet on the side of your screwdriver. This way, the screw stays on the tip and you can guide it into the servo grommet and attachment hole. The magnets are also handy for gathering screws on the workbench so that they don't roll around and get lost.



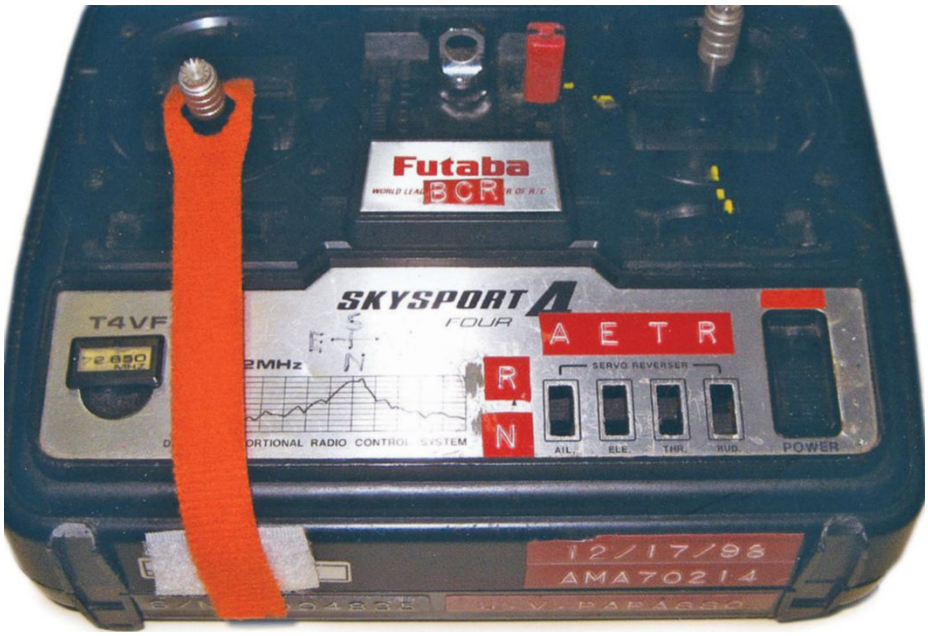
Nonmagnetic Screws

When it comes time to install screws deep inside an airplane, we usually rely on a magnetic-tip screwdriver. But often, the screws used to hold hardware in place may be made of nonferrous metal. To help get the screw in its rightful place, try the following trick. Push the screw through some tape and then place it on the end of the screwdriver. Next, fold the ends of the tape up against the screwdriver shaft and you've got a screw that won't fall off. Simple and easy.

Head over Heels

When it comes to mixing and applying epoxy glue, you can do the job much quicker if you keep your bottles upside down. Make a simple holding fixture out of some scrap wood, and place the bottles in holes drilled through the top shelf. If your workshop is not heated, use a heat gun or hair dryer to heat the bottles before squeezing the resin into a disposable mixing cup.

25 TOP SHOP TIPS



THROTTLE STRAP

Some pilots use a rubber band to secure their throttle stick on their transmitter to avoid the motor from accidentally starting up at full throttle. This is a good idea, but it isn't foolproof as the rubber band can stretch if the stick is forcibly bumped. Another technique is to use a Velcro strap as shown here. The straps are available in most sporting-goods stores and some hobby shops, and they greatly increase throttle/propeller safety.

Using What's at Hand

When you are in a pinch and need an extra set of hands or a holding jig to make a soldering job easier, try this: Use a set of vise grips to hold a pair of offset pliers as shown. The vise grips are heavy enough to make a stable base, and a rubber band wrapped around the pliers' handles allows them to clamp your work without slipping.

COLOR CODING

Here's a trick for when you start flying more advanced airplanes, gliders, or helicopters that require various auxiliary mixes and functions. It is often necessary to find and activate various switches on your transmitter to control the functions of your model. By slipping short lengths of different-colored fuel tubing over the switches, the search for that specific switch is much easier while dividing your attention between the switch and flying the model.

Easy, Accurate Cuts

When working with foam, there may be times when you have to insert carbon-fiber rods or servo leads at a certain depth. This can be accurately done with the aid of a bolt, a nut, and a few washers. Place the washers in the bolt, and add the nut. Slip the hobby knife between the washers, and measure from the tip of the blade to the edge of the washer. Using a ruler, set this measurement to the depth of cut you want and you're good to go. It will now be impossible to cut too deep or too shallow.

Hatch Security

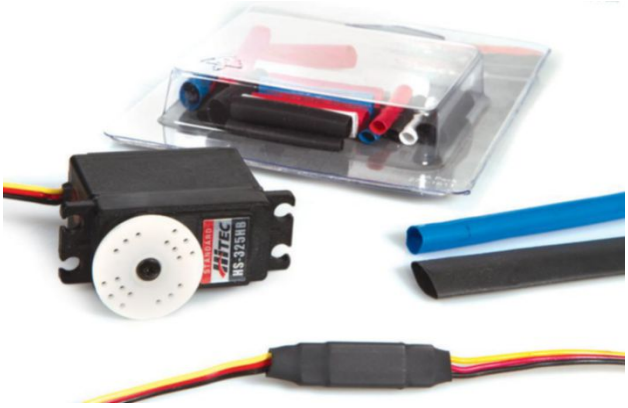
Keeping hatches in place is important, and losing one during flight is not a good thing. But sometimes, when you really get wild with your 3D aerobatic model, stock magnet hatch latches just aren't secure enough. A quick way to ensure hatch security is to add a cut-down servo arm as shown. A single screw secures the servo arm, which can be pivoted 90 degrees to allow the hatch to be open.

Perfect Plans Protector

With the popularity of today's quick-build ARFs, building model planes from kits is almost becoming a lost art. Instructions often say to build parts directly over the plans but give no suggestion on how to protect the paper plans from glue. The best (and most inexpensive) clear covering for the job is the clear backing sheets from film covering material. Since you have to buy covering material for your model anyway, you get two products in one. You don't have to cover all of the plans; cut and use only the sections of the plans that you need, then place the clear sheet over the area where the glue joints are. CA adhesives and wood glues don't stick to it, and you can save your plans for future reference.

SECURE SERVO CONNECTIONS

When you install servos in a wing and use long servo extension leads, the connector between the two can come loose during flight due to vibration. A simple safeguard is to slip a length of heat-shrink tubing over the connectors and apply heat with a hot-air covering gun. This will make a secure connection that's easy to remove later.



Straight Surfaces

The best way to set up your model for maximum performance and response to control inputs is to have all your control surfaces centered at their neutral positions without the use of trim or subtrim adjustments using your programmable transmitter. It is best to make mechanical adjustments when you are building or setting up a model. Use a piece of scrap balsa and a couple of clothespins to fix the surfaces to neutral. You can now make up and install your linkages without guessing at the center position. Do this along with the servo powered with the receiver so that it is also in neutral position.

No-Sand Repair

Sooner or later, most fiberglass cowls crack or become damaged when the screw heads holding them in place chafe through and enlarge the holes. Clean and then lightly sand the damaged surface. Make up a mixture of 20-minute epoxy and some microballoons (or filler made from finely chopped-up fiberglass cloth) and then apply it to the damaged area. Let it fill up the crack or enlarged hole. Place a piece of sandwich bag over both sides of the repair, and squeegee the resin out until it is smooth. Let it dry overnight. Drill a new hole, and lightly sand with fine sandpaper. Shoot some spray paint on it and the repair will be almost impossible to see.

52 SQUEEGEES

When it comes to spreading resin or epoxy glue, nothing beats a plastic laminated playing card. Cards are stiff enough to pull the resin, can bend to apply resin over rounded surfaces, and are cheap enough to be disposable after each use. No cleanup needed!

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MAY 3 – 7, 2017

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MODEL Airplane NEWS

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FTE Frank Tiano Enterprises

WE PICK THE TOP PLANE, RADIO, DRONE, AND INNOVATION OF THE YEAR!

BY THE ***MODEL AIRPLANE NEWS*** **CREW**

The editors of *Model Airplane News* spend many hours reviewing and highlighting hundreds of great products including airplanes, radios, hardware, and other related gear so that we can report what we find to our readers. Each year, after all the dust settles, we highlight and recognize those items that we think have risen to the top. Evaluations are noted, and the editors and the contributors that actually put the product through the paces consider everything from price and quality to engineering, strength, and the overall value you get for your money.

The task is always demanding as, each year, all the products that come through the *Model Airplane News* doors continue to push the bar up to higher levels. So after much discussion, consideration, and debate, here are this year's top four winners!

EDITORS' CHOICE 2017
Model Airplane News

Plane of the Year

Hangar 9 Model 12 Viking

HIGHLIGHTS

- Lightweight, rugged construction
- Excellent parts fit
- Awesome scale looks
- Amazing flight performance

This year's Plane of the Year goes to the Model 12 Viking 120cc aerobatic biplane by Hangar 9. The full-size Model 12 Viking is one of the most powerful biplanes ever designed for use on the airshow circuit. Hangar 9's giant-scale version has been expertly designed and built, and when it's powered by an appropriate 100 to 125cc gas engine, it delivers amazing 3D performance.

Construction is laser-cut built-up wood, and all of the parts fit precisely together to produce a rugged and lightweight airframe that can take the rigors of high-performance maneuvers. Also included are a painted fiberglass cowl and wheel pants as well as a colorful UltraCote trim scheme. Two-piece plug-in wings and a large fuselage hatch makes transportation and maintenance user-friendly. Including prehinged control surfaces and all necessary hardware, the Viking can accept a large variety of exhaust options, including mufflers, canisters, and tuned pipes.

With performance to match its terrific scale looks, we are proud to call the giant-scale Hangar 9 Model 12 Viking our Plane of the Year.

$1,399.99 | hangar-9.com

Radio of the Year

Spektrum DX6e

HIGHLIGHTS

- Budget price
- 250-model memory
- Easy-to-navigate program menu
- SD card–compatible

Our pick for Radio of the Year goes to the Spektrum DX6e. With an amazing collection of high-end pro-level features, the DX6e radio system is far from being just another budget radio. A feature-rich 6-channel radio, it uses the same DSMX technology and AirWare programming found in the higher-priced transmitters. Easy to use and set up, the DX6e is a great choice for the newcomers to the hobby as well as experienced RC pilots. Beginners can grow into it as their skills improve and their airplanes become more involved, and sport pilots will appreciate all the cool bells and whistles.

With an impressive 250-model memory and built-In telemetry, the DX6e has programming for four model types: airplane, helicopter, sailplane, and multirotor. It also has an SD card slot (card not included), so you can share model-memory setups with just about any other Spektrum radio user. The screen display has an easy-to-read layout and includes model name, a timer (activated by the throttle stick), battery-voltage icon and readout, the four main trim-position bars, a radio-on timer (total time the radio has been switched on), and a large model-type icon (a graphic image of the type of model, such as helicopter, quadcopter, glider, or airplane).

A cool new feature is being able to choose the type of icon you want to show on the display screen. Everything from sport and scale models, to World War II warbirds, jets, helis, quadcopters, and other multirotors are easy to select and display. And of course, there's a menu full of advanced features and settings to maximize your aircraft's performance. If you define value by measuring how much you get for your dollar, then the Spektrum DX6e is a solid investment for anyone looking for a serious programmable radio.

$179.99 (AR610 receiver included) | hangar-9.com

Drone of the Year

RISE Vusion Extreme Race Pack

With so many drones on the market today, it took a while to decide on a winner for this category. But when you want excitement, drone racing jumps to the top of the list—and from our reviews, the RISE Vusion Extreme Racer took the top honors.

Including everything you need to hop into drone racing in one complete package, the RISE Vusion comes with a monitor, goggles headset, transmitter, airborne video camera, and built-in 5.8GHz first-person-view system. The RISE Vusion has high-quality molded construction and includes LED lights. The outrigger arms are quick and easy to replace, and they snap into receptacles. The power system features 2280Kv outrunner motors paired with OneShot speed controls. Power comes from an included 3-cell 1500mAh LiPo flight pack, and it even has a mating plug already soldered on. A balance charger with an AC adapter, a spare set of propellers, and four AA batteries for the radio are also part of the package.

The transmitter has dual rates to increase or decrease stability and agility as well as a switch for flight modes. Mode 1 is the most stable, featuring self-leveling, and allows the drone to tilt approximately 30 degrees. Mode 2 also has auto-level attributes but permits up to 45 degrees of tilt. Mode 3 disables the self-level feature and lets the model fly at any angle and perform aerobatics. If you want to experience the excitement and challenge of drone racing with an everything-included package and basic plug-and-play simplicity, the RISE Vusion is a great choice.

$350.00 | explore-rise.com

HIGHLIGHTS

- Nothing else to buy
- Durable and rugged construction
- Great value
- Choice of flight performance

Innovation of the Year

Yuneec Breeze

HIGHLIGHTS

- Easy to fly
- Very user-friendly
- Excellent photo and video quality
- Easy app control

To win in this category, the product must have made significant advancement in the RC hobby and truly be at an advanced level of performance. The Breeze quadcopter camera drone from Yuneec hits these marks and delivers a great user experience at a reasonable price. It comes fully assembled and requires the downloading of the Breeze Cam app. Then, all you have to do to get it in the air is charge the batteries (two packs are included). The Breeze's camera is mounted in the back so that it is always facing the pilot, ready to capture photos or video selfies. Any smartphone will give you touchscreen control of the Breeze using the Breeze Cam app, and by using the various flight modes, you can capture complex shots with little or no drone-flying experience. About the only thing easier than sharing images on social media with this quad is flying it; it is, without a doubt, one of the easiest quads to fly that we have ever reviewed. A perfect first drone for anyone, the best part of the Breeze is that it's loaded with lots of great features usually available only with higher-priced quads.

The Breeze has a Selfie mode that makes it easy to hover the drone in just the right position for the best aerial images and videos. Other modes include Pilot mode, for complete control over the drone, and Orbit mode, which allows the Breeze fly around you or any other object. Made for everyone, the Breeze is stable, safe, and easy to fly. If you want a camera drone that takes good images and allows you to share them, the Breeze is for you. ✢

$379.00 | yuneec.com

RISE Vusion House Racer

A great way to take drone racing indoors

BY **JOHN REID** PHOTOS BY **CHERYL VOMACKA MALTBY**

First-person-view (FPV) racing is so addictive and fun that, now, having a quick way to take that excitement inside will be a must-have for every racer I know. The new Vusion House Racer is not just for the diehard drone racer; this bird opens up the fun and excitement of FPV racing for everyone.

HIGHLIGHTS

The Vusion House Racer comes completely assembled with all the motors, speed controls, and FPV system set to go. Included are the completely assembled House Racer, prop guards, a 3.7V 650mAh 20C LiPo battery pack and USB battery charger, transmitter, FPV-RM2 monitor, and goggles. The first step, as with many drones like this, is to charge the battery pack. For the House Racer, this is accomplished by using any USB port on the computer to plug in the LiPo battery charger.

Once that was done charging, I moved on to the sensor calibration of my transmitter to the House Racer. This is outlined in the manual and only needs to be done before the first flight. Most of the time, it is good practice to turn on the transmitter first. But if you don't get the battery plugged in within five seconds (before the left LED on the transmitter stops blinking), then turn off the transmitter and then turn it back on.

The Vusion House Racer has three flying modes. Mode 1 has auto-level and mild roll rates and limited tilt angles—perfect for new racers. Mode 2 still has auto-level, but it has a higher roll rate and more control sensitivity, which is good for the experienced quad racer. Mode 3 has no limits on the tilt and roll rates, and the quad will not auto-level; this is for experienced pilots only. From there, it is only a matter of turning on the

AT A GLANCE

MODEL
Vusion House Racer

MANUFACTURER
RISE (explore-rise.com)

TYPE
Racing rig

SIZE
120mm

WEIGHT
2.4 oz.

ASSEMBLY TIME
None

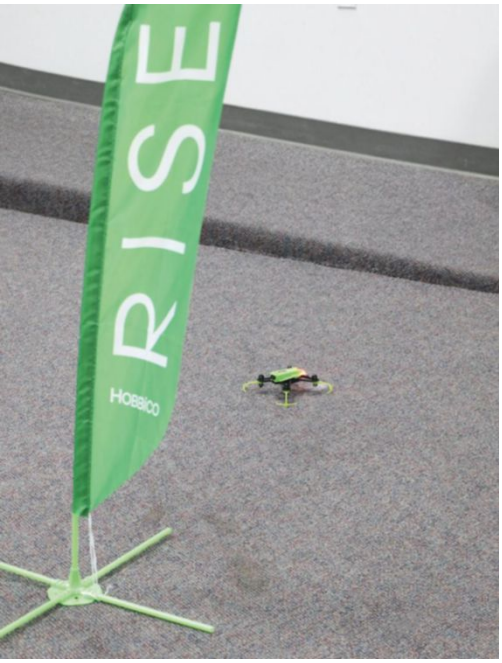
BATTERY
3.7V 1S 650mAh LiPo

FLIGHT DURATION
5 to 6 minutes

PRICE
$179.99 (RTF); $79.99 (FPV-R); racing gates, $39.99

WHAT WE LIKE

- Easy to fly with advanced modes
- Fast and responds quickly
- FPV ready to go
- Just plain fun!



The pylon gate that is included in the racecourse gate system is fairly large, so it's easy to fly around using FPV.

Even without the prop guards, the landing gear do good job of protecting the propellers.

THE MONITOR CAN BE ATTACHED TO THE TRANSMITTER OR MOUNTED INSIDE THE GOGGLES TO GIVE A COMPLETELY IMMERSIVE EXPERIENCE.

The Racecourse

One of the other things that adds to the value of the House Racer is that you can fly it on the optional RISE racecourse gate system. This gives the course a realistic feel and really drives the competitive spirit. For $39.99, the FPV Race Gate System comes with three guide arrows, two ring gates, a pylon gate, and a checkered gate. (After all, you need to know who won!) These pieces are easy to assemble and very durable. The rings can be used on the ground or attached to the wall or ceiling, and are just the right size to make it challenging to traverse through. While this kit includes enough gates for a nice racecourse, it is easy to expand with additional items such as the RISE Arch Race Gate with flags, the LED Ring Gate, and the Elevated Race Gate. So go ahead and expand that racecourse and really tear up the house.

Setting Up the Video Transmitter

What makes FPV drone racing so fun and addictive is the ability to see and fly through the world from the cockpit point of view. It has been referred to as an out-of-body experience, and you will know the feeling the first time you pass yourself sitting there on the couch when your ship continues to fly down the hall. The Vusion House Racer comes with the camera and video transmitter installed, so you just need to make sure that they're on the same frequency. If your goggles are on one band and the House Racer is on the other band, then you will not be able to see through the camera. There is a quick fix to that: Switch the camera button on the bottom of the House Racer to change to a different FPV frequency band. Just press the button and run through the channels on your goggles until you can see an image; if that doesn't work, repeat as needed until you get a clear signal and picture. This may also be necessary if you're flying more than one House Racer; each will need to be on a different band/channel.

The monitor is bright enough to be seen in any light and can be used for FPV flight. The same monitor is installed in the goggles to give you that completely immersed feeling.

FPV-RM2 monitor; if the video transmission is not coming through, just hit the channel button until you see the video image. The monitor can be attached to the transmitter or mounted inside the goggles to give a completely immersive experience. Once I had video, it was time to tear up the house.

The complete package has everything you need to get started racing and tearing up the house.

AERIAL RECAP

For a small quad, the Vusion House Racer is a very stable bird in modes 1 and 2. If you venture to mode 3, just make sure that you are a good pilot because you will be completely in charge of that bird. To fly, the first step is to calibrate the transmitter before the first flight. After that, I plugged in the battery pack on the House Racer, set it down on a flat surface, and then restarted the transmitter. The House Racer armed immediately. To get the motor to arm, I just pushed the left stick to the bottom right; disarming is the same stick pushed to the bottom left. I throttled up and got the racer up to about 3 to 4 feet before flying it around the house.

Two things make this a fun bird to fly. It is very stable and durable, which means that flying it was easy and it stayed where I flew it. It drifted when the sticks were left at center, but this was a slow drift that was easy to correct, and it was simple to stay on top of it. I also bounced off the walls a few times with no damage to the quad or marks on the walls, and I was able to keep flying after the hits. The quality of the image in the FPV-RM2 monitor is quite good, and it was easy to fly the House Racer around by just watching that screen. Flying FPV around the house, of course, is a little challenging, but at the same time, it is a whole lot of fun.

BOTTOM LINE

Even if you are not into FPV racing or a diehard racer, or even if this is the very first time you have ever flown a quad, you will have a lot of fun with the House Racer. Having one of these racers for each family member will make for a great evening of fun. But I warn you now, you will need a lot more batteries! ✚

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SUPER COUPON $89.99

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PITTSBURGH AUTOMOTIVE — SUPER COUPON

12 VOLT, 150 PSI PORTABLE INFLATOR

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SAVE 36% $9.99 comp at $10.99

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2.5 HP, 21 GALLON, 125 PSI VERTICAL AIR COMPRESSOR

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RETRACTABLE AIR HOSE REEL WITH 3/8" x 50 FT. HOSE

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69265/62344

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Wheel kit and battery sold separately.

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PITTSBURGH — SUPER COUPON

16 OZ. HAMMERS WITH FIBERGLASS HANDLE

CLAW	RIP
ITEM 69006	ITEM 47873 shown
60715/60714	69005/61262

Customer Rating

YOUR CHOICE $3.99

SAVE 77%

$4.99 comp at $17.99

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US★GENERAL — SUPER COUPON

26", 4 DRAWER TOOL CART

ITEM 95659 shown
61634/61952

- 580 lb. capacity

SAVE $269

Customer Rating

SUPER COUPON $99.99 $149.99 comp at $369.32

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7 FT. 4" x 9 FT. 6" ALL PURPOSE WEATHER RESISTANT TARP

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69129/69121/877 shown

SUPER COUPON $7.99

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$49.99 comp at $8.48

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10" PNEUMATIC TIRE

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SAVE 73%

SUPER COUPON $3.99

Customer Rating

Not for highway use.

$5.99 comp at $14.99

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PITTSBURGH AUTOMOTIVE — SUPER COUPON

42" OFF-ROAD/ FARM JACK

ITEM 60668/6530 shown

- 3-1/2 ton capacity

Customer Rating

SAVE NOW

SUPER COUPON $39.99 $59.99

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GREENWOOD — SUPER COUPON

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1-1/4 GALLON HOME AND GARDEN SPRAYER

ITEM 61280/63124
63145/95692 shown

Customer Rating

SUPER COUPON $8.99

comp at $14.97

$12.99

54590233

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CHICAGO ELECTRIC POWER TOOLS — SUPER COUPON

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Blade sold separately.

12" SLIDING COMPOUND DOUBLE-BEVEL MITER SAW WITH LASER GUIDE

ITEM 61969/61970
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Customer Rating

SUPER COUPON $134.99

$199.99 comp at $339

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BADLAND — SUPER COUPON

2500 LB. ELECTRIC WINCH WITH WIRELESS REMOTE CONTROL

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61840/68146
61297/63476

SAVE $70

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SUPER COUPON $49.99 $89.99 comp at $119.99

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HOW TO

Servo Programming 101

TAKE ADVANTAGE OF TECHNOLOGY TO MAKE PLANE SETUP A BREEZE

BY **JOHN REID**

Today's modelers have an overabundance of servos to wade through when making a purchase to complete their latest aircraft. Servos come in different designs, types, sizes, torque power, and travel speed. In addition to that, servo systems can individually program custom parameters to each servo. In this article, we'll explore some programmable servo systems and see how they can help with setting up your plane.

WHY PROGRAMMABLE SERVOS?

As airplane models became larger, there was a need to gang up more than one servo to each control surface. Modelers and designers quickly found out that they needed more precise servos with adjustable travel and endpoints so that they could match them up. Digital servos satisfied the need for precision movements, and adding a way to program them individually allowed them to be matched up to a single control surface.

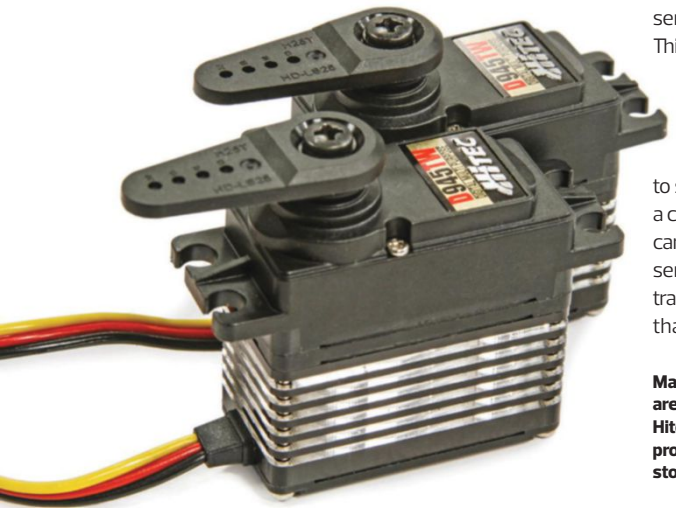
Servo programming lets you change each servo's travel direction, servo speed, neutral point, and endpoints. On some digital servos, you can program in overload protection and resolution mode settings.

While you can program all these servo features through higher-end computer radio systems, that can add up to many separate channels needed on the receiver for each servo. If you use something like a JR MatchBox or Futaba MSA-10m, you can attach up to four servos to a single channel input to adjust each servo's travel, center, and endpoint, but these add weight to the aircraft.

The advantage of programming the servos themselves is that you need less equipment inside the aircraft, thereby saving weight. Dual flaps or dual elevator surfaces, for example, require one servo to rotate clockwise, while the other one rotates counterclockwise to operate with the same mechanical advantage. By using a servo programmer, each digital servo can be programmed with the correct rotation as well as identical deadband width, neutral points, and endpoints. Now, the two servos—one for each control surface—can be plugged into a Y-harness and into one channel on the receiver without any mixing.

This same programming advantage can be used when "ganging" digital servos together for a single control surface. By custom-tuning each digital servo's deadband width, endpoint, and neutral point, all your servos will have identical movements. This allows the servos to be slaved together for a common task, without them fighting each other over the neutral or end positions.

Hitec RCD sales manager Shawn Spiker explains it this way: "The biggest advantage is making two different servos digitally identical. This really comes in handy when you are using multiple servos on the single control surface. If you need to slow a servo down for a certain application, you can program that into the servo itself—even if your transmitter does not have that capability."



Many of the Hitec servos are programmable with the Hitec programmer. All of the programmed information is stored inside the servos.

S.BUS AND XBUS

Futaba's S.Bus and JR's XBus systems are unique in that the servos (or converters) can be programmed to listen only to the commands of one channel. This allows a single wire to carry the protocol of all channels, while the programmed servo, when plugged into this cable, will listen only to the channel it is programmed to. The systems also allow two-way communication, so it is easy to set up telemetry from sensors on the aircraft. In the Bus systems, the individual servos can also be programmed with different settings in much the same way as you can program digital servos.

S.Bus and XBus servos from Futaba and JR come in a variety of sizes and torque power.

I PROGRAM THE SERVOS AFTER I HAVE MOUNTED THEM TO THE CONTROL SURFACE SO THAT I CAN SEE HOW THE PROGRAMMING AFFECTS THE CONTROL SURFACE.

Left: **The new Hitec HFP-30 servo programmer is easy to use and the menu system is intuitive, making servo setup a breeze.**

Below: **The Futaba SBC-1 is a stand-alone S.Bus channel changer that allows pilots to set each servo to the channel they want it to listen to.**

CUSTOMIZE YOUR DIGITAL SERVOS

Hitec offers digital servo programmers that work with their digital servos. The programmers' battery must first be charged; after that, just plug in the servo you want to program, then navigate to the appropriate menu for the type of program you wish to do (e.g., endpoints). You use the control knob to move the servo arm to the point you wish it to stop and press the appropriate button; that position is now the new servo endpoint. Do the same for the other endpoint and center. Reversing the servos is even easier: Navigate to the set rotation menu and pick either clockwise (CW) or counterclockwise (CCW), and close that screen; the servo now moves in that direction.

You can match up and program servos on the bench, but most of the time, I program the servos after I have mounted them to the control surface so that I can see how the programming affects the control surface. The process is the same: After the servo is installed, plug it into the programmer and dial in the menu you need to program. The nice thing is that I can quickly set the center so that, for example, the ailerons will line up at center and, from there, I can quickly move to the endpoint (or control throw) setup suggested by the manufacturer. Set them and move on to the other side.

Programming S.Bus or XBus servos is about the same, but these allow you to use a computer or the suitable manufacturer's programmer. Using S.Bus for the example, you can use the PC-Link program with the CIU-2 or the SBC-2 to program the channel so that the servo will listen only to that programmed-in channel, no matter where it may be connected in the system.

The PC-Link program and the CIU-2 also enable you to program the direction, speed, endpoint, and other parameters into each S.Bus servo. This is great for dual elevators that you may have on a single channel. You can program each servo to have different center and endpoints, along with them moving in the opposite direction. That way, they can work as one, even though they are moving in different directions.

The programming aspect also allows the use of multiple servos on a single control surface so that they work together without binding. Because it is the S.Bus system, you don't have to worry about plugging in the servos into the wrong connection—it doesn't matter. Each servo has its center and endpoint programmed in, and it will listen only to the channel it is programmed for, no matter where it is plugged in the system.

BOTTOM LINE

It is easy to see the value of programmable servos for many aircraft needs. Today, they are available from many different manufacturers and come in a wide array of sizes and power. So for your next project, take advantage of technology and see how much easier it is to set up your aircraft with programmable servos.

LET'S TALK GIANT SCALE

BY **JOHN GLEZELLIS**

Top Gun competitor PJ Ash tending to an FW 190 before a flight. Notice the open access hatch on the fuselage, where the switches and air valves can be easily accessed.

Redundant power-supply options

When you build a realistic giant-scale model after a specific full-size aircraft, you have many options to consider. You must not only select certain equipment to promote redundant and safe practices but also decide on the level of physical detail you wish to achieve. For example, do you want to simply construct and fly a semiscale airplane that resembles the full-size subject yet has exposed switches? Or do you hope to conceal these items for added realism?

As world-renowned RC scale designer, builder, and competitor Dave Platt has said time and time again, "The subjects that require the greatest number of working channels have the least room for radio gear." Scale models—and, in particular, giant-scale airplanes—often have multiple servos to actuate a single control surface. Additionally, in more complex builds, numerous servos are also required for various functions handled by items like pneumatic cylinders, which are required to actuate sliding canopies, landing-gear doors, and more options. Factor in a scale cockpit interior and you will realize the truth of Platt's statement!

This month, we will examine a few options behind redundant power-supply options with respect to a given aircraft and the available space needed to secure each component. We will also look into a few methods in which certain items can be concealed for added scale detail.

LET'S TALK OPTIONS

During the build of a scale aircraft, it is important to analyze the model in comparison to the full-scale subject. Examine the real plane's panel lines and access panels as these will be possible areas to conceal certain electronic items (e.g., heavy-duty switch assemblies, charging connectors, etc.), and centrally locate as many components as possible to prevent excessive wiring. With an idea of the general available space that each item must adhere to, you can begin a search to select the required high-quality equipment needed to suit your requirements. Specifically, this list includes receivers, batteries, switches, extensions, voltage regulators, and external power-supply units with regulated output voltages.

One of the most basic manners in which you can implement redundant power in a given receiver is to use two switches and two separate batteries to power the receiver of the model. Interestingly—at least in all of

the receivers I have seen thus far where the battery port is located alongside the other receiver input ports—all of the positives are linked together, as are all of the negatives. This means that you can simply supply power to the receiver through any of the servo connectors to add a second battery to the equation. Keep in mind, though, that this is for a standard application where one receiver is used (e.g., a Spektrum AR9030T 9-Channel Air Integrated Telemetry Receiver). Spektrum also offers various PowerSafe receivers that offer dual-battery redundancy—where each battery is isolated, and if one fails and/or shorts, the other battery will continue to power the plane. At a minimum, always use a dual-battery system in a giant-scale aircraft as the added weight will pay off in the event of a battery failure.

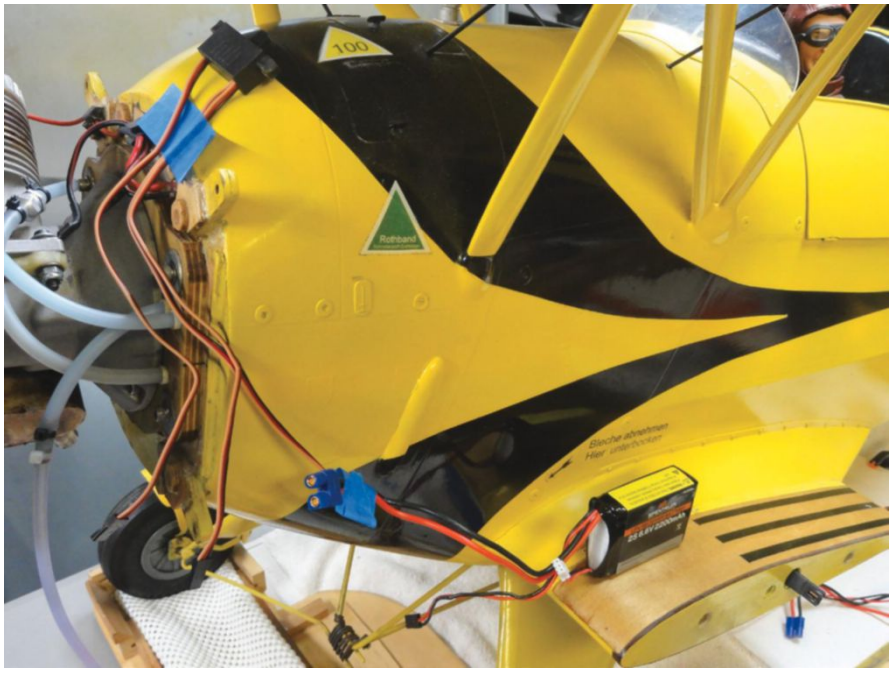
If a given radio system does not feature the technology mentioned previously, you can use two receivers. Over the years, I have seen a few Futaba users use two receivers, such as the Futaba R7008SB receivers, and divide the aircraft in half so that one receiver controls the right aileron, right elevator, and rudder surface and the second receiver controls all remaining channels. Each receiver is powered by its own battery and switch, but as an added step of security, you can use a male-to-male jumper that will connect from one receiver to the other. With the jumper, even if power is lost from one battery source, the second battery will keep power supplied to the entire airplane!

There are a few switch options for these scenarios. For example, Spektrum offers a Deluxe 3-Wire Switch Harness that allows you to connect the switch to both the receiver and receiver battery, while the remaining lead to a supplied mounting bracket lets you charge the battery through the included receptacle. If space is a concern, you might also wish to examine the Wolverine switch from Fromeco, which offers a fairly compact form factor. This switch contains two switches, two battery-check jacks, and shared circuitry.

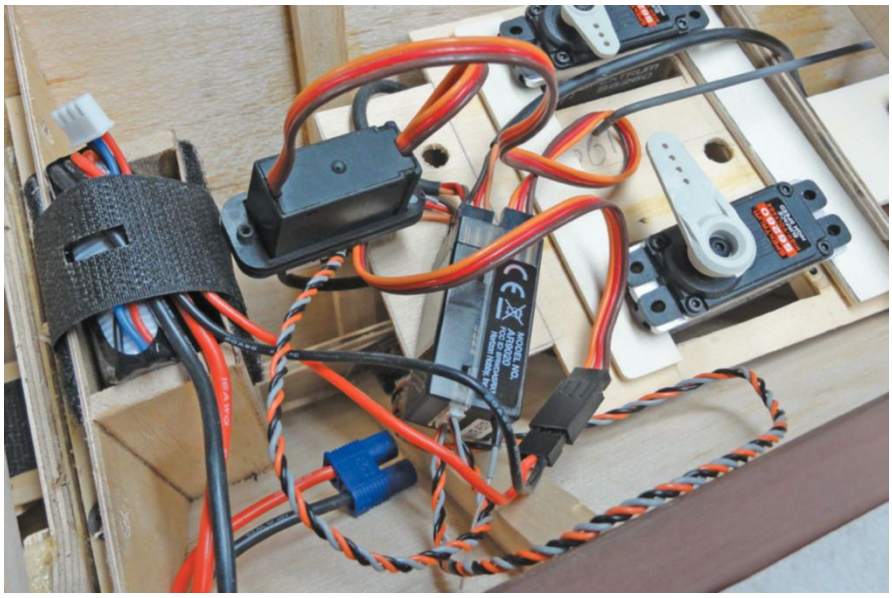
Completely separate from the switch and receiver combinations mentioned earlier, the PowerBox Royal SRS includes a switch that supports telemetry from Spektrum, Futaba, and others. With this unit, the workload of the receiver is decreased. In addition to features like servo matching, this unit supports dual-battery regulated output to either 5.9 or 7.4 volts with support of LiPo, NiMH/Ni-Cd, and LiFe/LiPo batteries.

BATTERY-SELECTION BASICS

With three different methods allowing for the redundant practices mentioned, let's transition to battery selection. Generally, no matter what type of battery used, I like to remove the flight batteries from the aircraft while charging

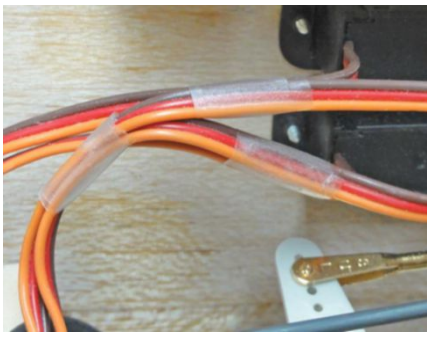


To determine placement of the receiver switches and batteries on the Bücker Bü 133 Jungmeister, I have temporarily secured each component into position using masking tape to determine lead lengths before permanently installing all components.



The receiver batteries in this Handley Page monoplane have been installed in a battery box, which contains a hook-and-loop strap. In the event of an emergency, the batteries can be taken out of the model within seconds with the simple removal of the strap.

Using hook-and-loop material, a battery has been properly installed on the inner wall of a wood engine box, where I can remove and view the battery condition while it is charging.



Always secure servo and battery leads in position to prevent unwanted movement while the aircraft is in flight.

Above: **Adding labels to mark specific switches simplifies the process while one prepares the airplane for another flight.** **Left:** **On this 1/4-scale Super Decathlon, access to the fill valve, batteries, and three switches occurs through the side door to fully conceal all items.**

so that the aircraft isn't at risk. While some might view this as being overly cautious, I have witnessed a battery catch on fire while it was inside a beautiful scale airplane!

For those who prefer a Ni-Cd or NiMH battery, a voltage regulator is not needed when using a 4.8V or 6V battery. You can save weight and overall space, however, when using a similarly sized LiPo or Li-Ion battery. If using either of these, you'll need a voltage regulator to supply the desired voltage to both the servos and the receiver if the servos are not capable of handling 8.4V. Always look at the specifications on all electrical components used throughout an airframe, and follow the factory-recommended settings.

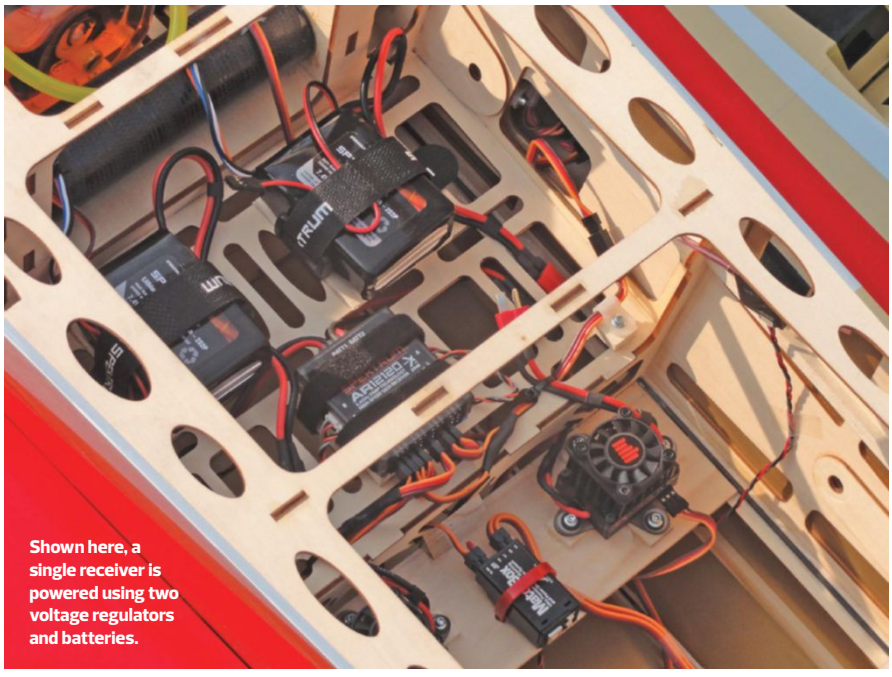
I use LiFe batteries on most of my models with the exception of my giant-scale aerobatic airplanes. On these extreme aerobats, like my Composite QQ Yak 54 from Hangar 9, I use LiPo batteries for the servos with a LiFe battery on the ignition to avoid the use of a voltage regulator because I prefer to keep the radio installation as simple as possible. If a voltage regulator is mandatory, you should use a redundant regulator. If, for example, the power switch for the Spektrum VR6007 regulator becomes unplugged in flight, it fails in the "on" position; once the airplane returns safely after a given flight, you will notice that you cannot turn the model off to troubleshoot the source of the problem.

SCALE DETAIL OPTIONS DEFINED

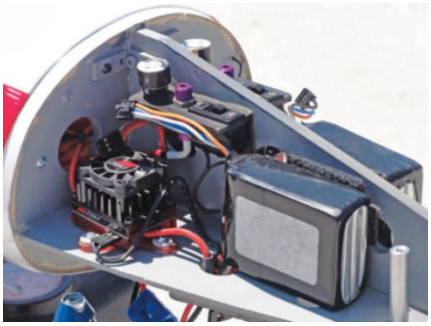
No matter what redundant power method you choose, you will need to be clever if you want to conceal certain components like the receiver switches, charging leads, and so on. The next step is to connect the batteries to their corresponding switch harnesses, connect the switches to the receiver, and take a few measurements to see where all the components will need to be positioned, without modifying any of the heavy-duty wires that are on each of the items as some voltage loss can occur with different extension lengths and under certain loads.

As one example in concealing various switches, years ago, I purchased a Robart P-47 where I opted to install the receiver switch within the canopy hatch as the entire cockpit was removable. However, because I wanted to keep the ignition switch separate, I decided to install this switch under one of the cowl flaps because adequate space existed between the cowl flap and the fuselage. I simply secured hardwood blocks to the plywood bulkhead and used wood screws to fasten the switch in position.

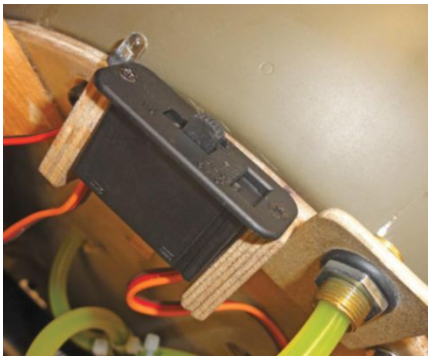
Others prefer to create access panels in which a panel is hinged to the airframe using



Shown here, a single receiver is powered using two voltage regulators and batteries.



With the installation of the nose cone, the cone will prevent the batteries from moving. Hook-and-loop material, however, firmly secures the batteries in position.



On this Robart P-47, the ignition switch has been secured under a cowl flap. When the cowl is secured, it is difficult to notice the location of the hidden switch.

traditional plastic hinges; door hinges, like those available from Sonic-Tronics; or brass hinges. Then, a rare-earth magnet can be used as a latch. Once the hinges are secured in position, mount the magnet to the inside of the hatch; on the opposite side of the hatch, mount a metal washer to hold the hatch closed. Such access points can be used to allow access to the ignition module, switches for the engine and radio system, charge ports for all batteries, and various valves and/or gauges. Within the hatch, a recessed panel is attached to the airframe to which each item can be secured.

FINAL THOUGHTS

Over the course of this column, I have discussed a few common methods to prevent certain failures from occurring while adhering to specific scale standards. Using this article as a guide, research other possible redundant power technologies. Scale model building is a progressive experience, and builders evolve over time with exposure to other scale enthusiasts. Aside from proper build practices, however, always monitor the condition of your airplane through routine maintenance and preflight checks. After all, a few extra minutes spent on the ground might prevent a potentially catastrophic failure from occurring.

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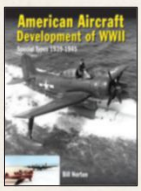

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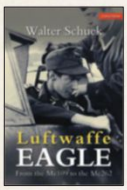

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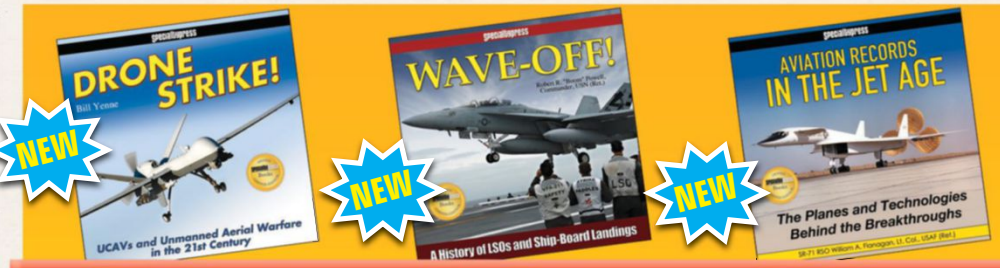

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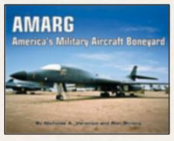

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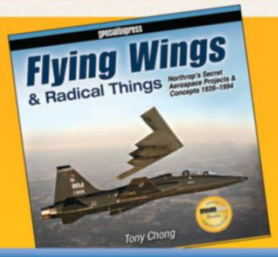

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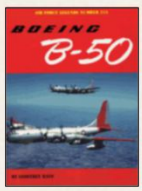

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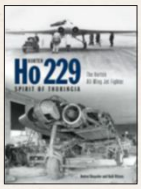

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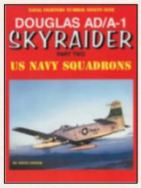

DOUGLAS AD/A-1 SKYRAIDER: Part Two *Ginter* Covers Skyraider Fleet and Utility squadrons with descriptions about each squadron along with vintage photos, squadron patches and unit insignia. 8-1/2 x 11, 272 pgs, 740 photos. SC Item # GB836 .....$55.95

COLLECTING VINTAGE PLASTIC MODEL AIRPLANE KITS *Kodera* The author examines vintage model airplane kits and highlights what collectors should look for in building their collections. Covers model development in the heyday, and includes pricing for vintage kits. 8-1/2 x 11, 128 pgs, 440 photos. SC
Item # SP162 ..... $24.95

MIKOYAN MiG-17: Famous Russian Aircraft *Gordon & Komissarov* The book fully describes the MiG-17's development history and combat operations in various major wars and local conflicts. A separate chapter also compares the MiG-17 and its foreign counterparts and concludes with details of MiG-17 fleets and operators worldwide. 8 x 11, 480 pgs, 1,200 photos. HC Item # MC372 .....$64.95

HYPERSONIC: The Story of the North American X-15 *Jenkins & Landis* **This is the most extensively researched history of the X-15 program yet produced, written with the cooperation of surviving X-15 pilots as well as many other program principals. It covers the tasks of converting and testing the B-52 carrier airplanes and more. 9 x 9, 276 pgs, 550 photos, 100 drawings. SC Item # SP131 ~~$28.95~~ $14.48**

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TEXT & PHOTOS BY **DENNIS SUMNER**

The author with his just test-flown prototype. The smile tells the whole story. (Photo by Charlie Dochenetz)

Electric Mooney Mite

A unique 1/6-scale classic you can build

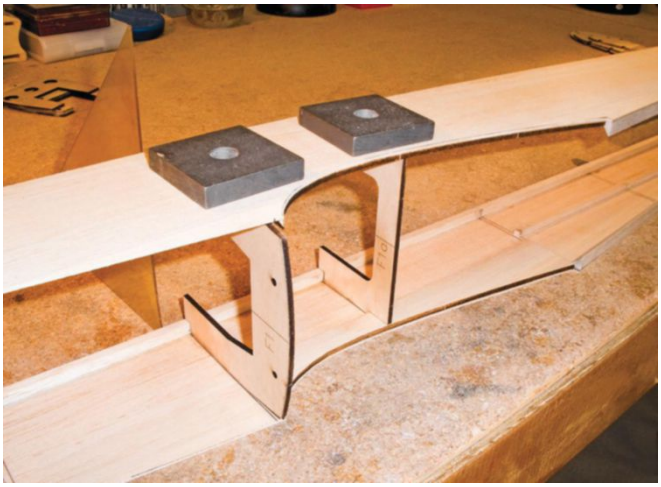
I like unique and lesser-known general aviation airplanes, and so, with a little prodding from fellow electric flier Mike Brinker, I picked the Mooney Mite for my most recent project. The model is all-balsa construction, and it features a fully sheeted wing and 3/16-inch balsa tail surfaces and is equipped with E-flite 15–25 electric retracts. The model features a large top hatch to make battery changes easy, and the build is pretty straightforward. To help speed it up, I asked Top Notch Kits (TNK) to laser-cut my cowl pieces, firewall, formers, and wing ribs. I also used the TNK 1/6-scale A-65 scale engine kit to help dress up the nose of the airplane. If you are interested in building a Mooney Mite of your own, TNK has all my CAD files and can cut a short kit for you as well (topnotchkits.com).

GETTING STARTED

Start by cutting the tail feathers out of 3/16-inch balsa, then cut out the 1/16-inch balsa sides using the plans for a template. Make the forward area between the firewall and former F-1 about 1/8 inch oversize at the bottom to allow extra balsa for the rounded firewall and F-1. Make left and right sides, mark the locations for the firewall and formers, then glue 1/4-inch square balsa longerons to the top of the sides and cut and glue the 3/16-inch square and 3/8-inch triangle pieces. Add 1/16 balsa filler to each side for the tail post, and sand the tail to fit together, using the fuselage top view as a guide.

Glue formers F-1 and F-1a to one side, making sure that they are at 90 degrees to the side, then glue them to the other fuselage side. Add the 1/8-inch balsa wing saddle, then place the fuselage over the top view and add formers F-2, F-3, and F-4. I had to wet the 1/4-inch longerons forward of F-1 to get the sides to pull together while installing the firewall and the nose-gear mount. Sand the bottom sides from the firewall to F-1, then add 3/16-inch square

The tail feathers are made out of solid 3/16-inch balsa sheet. Simple straight lines make them quick to make.



Start building the fuselage by gluing the top longeron in place, followed by these two formers. The weight holds them firmly in place until the glue dries. Make sure that the sides line up with each other.

longerons at the bottom from firewall to F-1. The plans show a 75-degree angle alignment tool to set the angle of upper former H-1. Set the angle and then add the 3/16-inch square stringer to the top of the formers. Make up the parts for the spring latch, install it to the hatch area, then add the sheeting to the turtledeck and top forward section of the fuselage using 1/16-inch balsa.

Wait to sheet the bottom of the fuselage aft of former F-2 until you've installed the servos and pushrods. Also wait to install the lower forward balsa block to facilitate drilling the holes for the wing-alignment dowels. Cut and glue the 1/4-inch plywood nose-gear mount in place using 15-minute epoxy.

HATCH COVER

Make the hatch floor from 1/16-inch balsa with the grain running from side to side, and pin it to the 1/4-inch square fuselage longerons. Then cut and fit the 3/16-inch square balsa stringers and formers H-1A, IP, and H-3. Measure off the plans, add former H-2, and set the angle using the H-2 alignment tool shown on the plans. Now add the top 3/16-inch square balsa stringer to the top of the hatch formers. Make a paper template to work out the shape of the hatch sheeting. Remove the hatch from the fuselage, and pin it flat to your workbench to hold it straight prior to sheeting.

ENGINE COWL

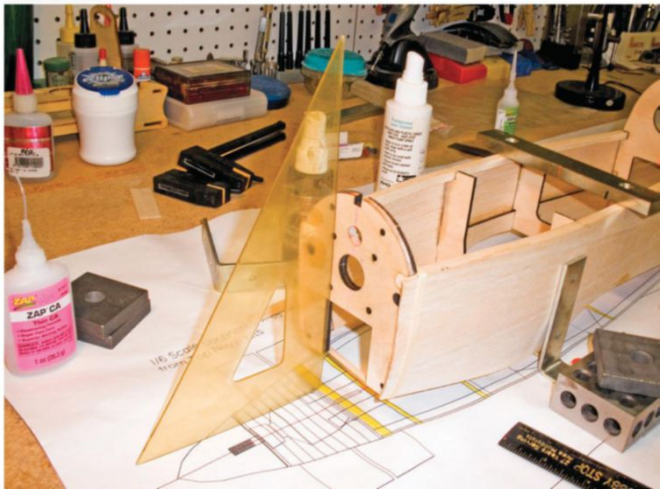
The cowl is shaped from laminated pieces, and the required nine pieces are stacked and assembled onto 1/8-inch music wire that fits into drilled pine blocks. I used Titebond yellow glue so that the seams between the balsa pieces sand easily. The finished cowl is held in place with 1/4-inch rare-earth magnets and aligned with the fuselage with 1/8-inch alignment dowels.

SPECIFICATIONS

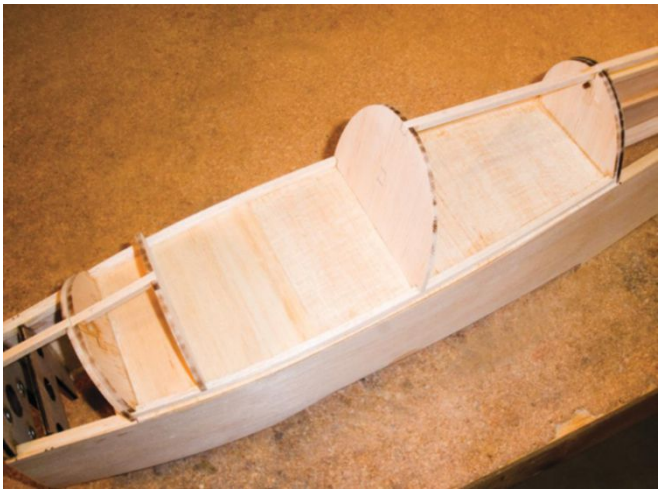
Model: Mooney Mite
Type: Electric sport scale
Wingspan: 54 in.
Wing area: 409 sq. in.
Weight: 56 oz.
Wing loading: 19.72 oz./sq. ft.
Power req'd: Scorpion 3014/1040Kv or equivalent
Radio req'd: 5-channel (rudder, elevator, ailerons, throttle, retracts)

GEAR USED

Radio: Spektrum DX9 w/ AR6210 receiver (spektrumrc.com); JR SM241 servos for ailerons (jramerica.com); Hitec HS65 servos for rudder and elevator (hitecrcd.com)
Motor: Scorpion 3014/1040Kv (innov8tivedesigns.com)
Speed control: Castle ICE 50 ESC (castlecreations.com)
Battery: Glacier 3S 4000mAh LiPo (buddyrc.com)
Propeller: APC 10x7E (apcprop.com)
Retracts: E-flite 15-25 (horizon hobby.com)



When you install the firewall, make sure that it is square with the workbench. This ensures the proper 0 degrees of motor thrust.



The main fuselage hatch is built on top of the assembled fuselage. There are angle-alignment template tools shown on the plans to properly install the upper formers.

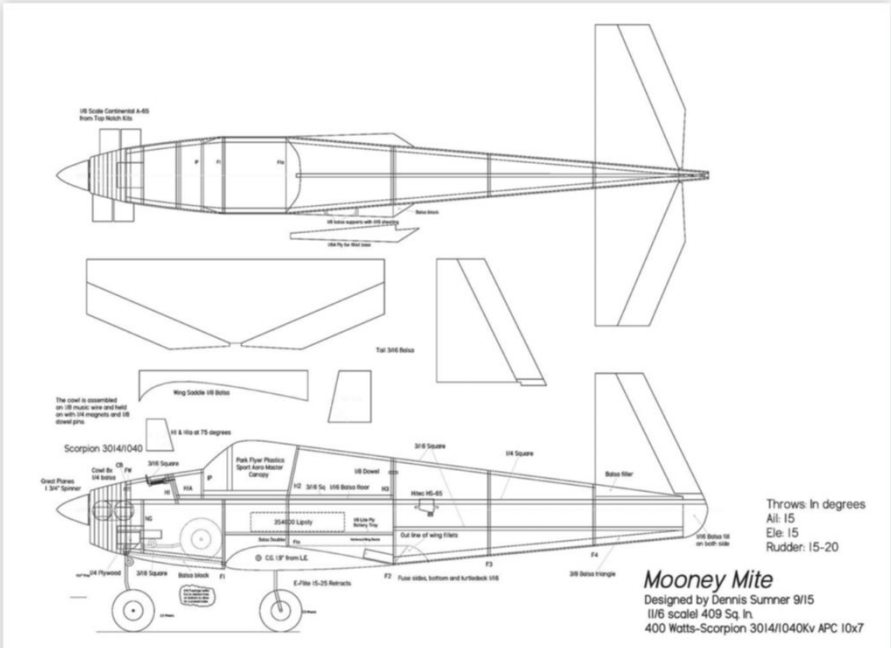
WING CONSTRUCTION

Use your favorite method to glue the sheeting together and prepare four sets of wing skins. Pin the 3/16-inch balsa spar to the bottom sheeting, then add the ribs and the rear 3/16-inch spar between ribs R-1 and R-5.

The plans show an R-1 angle tool to easily set the center-rib angles for the 10-degree wing-dihedral angle. Add plywood LG-1 and LG-2 landing-gear mount pieces between the plywood R-3 and R-4 ribs. Use a piece of scrap aileron stock to shim the sheeting up at the leading edge. To build in the wingtip washout, shim up the trailing edge of ribs R-9 to R-12 with a piece of tapered 1/8-inch balsa sheeting. Glue the top 3/16-inch spar in place, then cut and glue the 1/8-inch balsa strip to the back of the ribs and the 1/16-inch balsa subleading edge strip to the front of the ribs. Sand the leading-edge and trailing-edge balsa strips to match the contour of the ribs.

Using the plans as a guide, make a template to position and cut out the aileron-servo-mount locations, then glue the plywood mounts in place. Rough-cut the openings where the retract units will mount, then cut and glue the hardwood retract mount rails. Now is a good time to add a pull string for the aileron servos (I use dental floss). Add 1/16-inch balsa shear webbing from ribs R-2 to R-12 and the 1/16-inch plywood shear web between ribs R-1 and R-2. Also add the plywood wing-dowel reinforcement behind the leading edge from ribs R-1 to R-2. Now add the top-wing sheeting, then, to set the washout, use a scrap piece of 1/16-inch balsa under the bottom spar and a scrap piece of aileron stock under the leading edge while keeping the tapered 1/8-inch balsa strip under the trailing edge between ribs R-9 to R-12.

With the wings sheeted, add the solid balsa trailing edge and leading edge. Shape and sand the leading edges to shape, then glue the wing halves together with 30-minute epoxy. Trim the trailing edge of the wing to fit between formers F-1 and F-2. Now is a good time to sand the fuselage/wing saddle for a good fit and check to make sure that the wing incidence is at 0 degrees. When satisfied with a good fit and incidence angle, drill the holes for the 3/16-inch-diameter hardwood wing-alignment dowels. Add hardwood blocks in the fuselage for your nylon wing-attachment bolts. I used 1/2-inch hardwood dowels installed in the wing

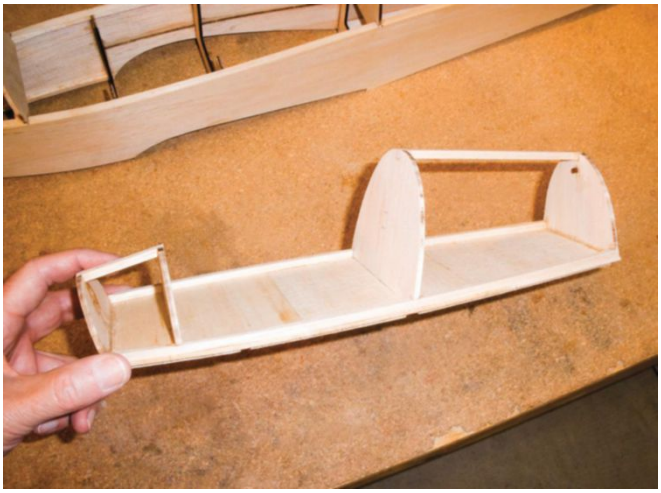


Mooney Mite | **XO617A**

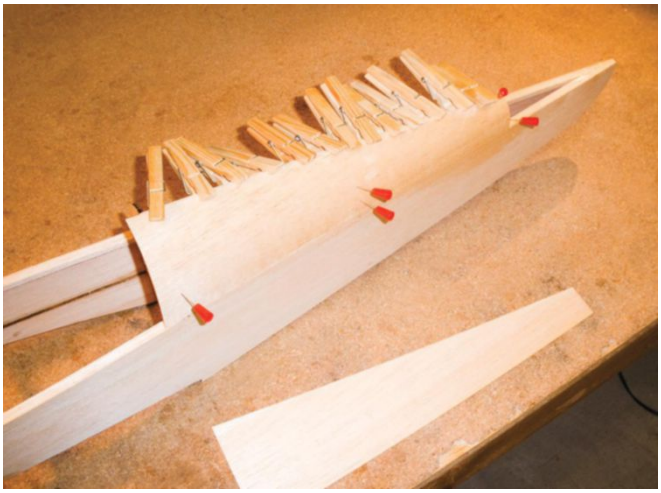
Designed by Dennis Sumner, this 1/6-scale sport flier has all the scale looks and great-flying performance of its full-size counterpart. Using traditional wood construction, the model has a fully sheeted wing and retractable trike landing gear. Laser-cut parts are available from Top Notch Kits and are called out on the plans.

Wingspan: 54 in.; power: Scorpion 3014; radio: 5-channel: LD: 2; 2 sheets; $23.95

To order the full-size plan, visit AirAgeStore.com.



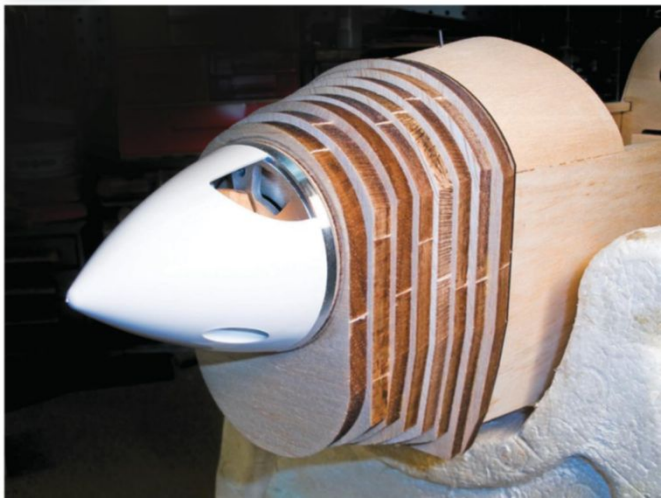
Here, the hatch-cover framework has been removed from the fuselage. It is then pinned to the workbench to keep it straight while applying the balsa sheeting.



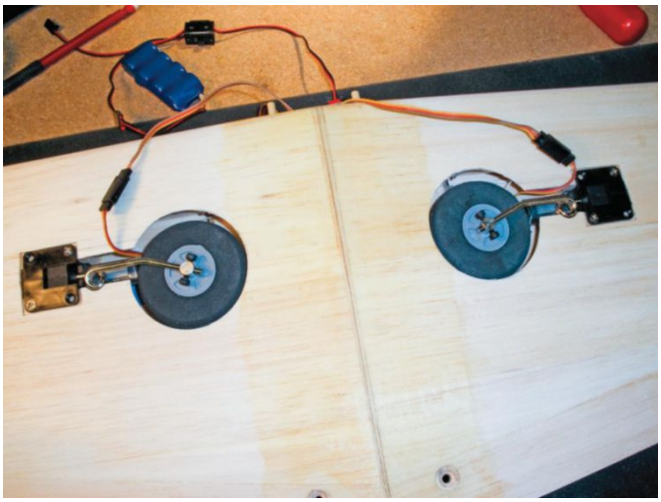
Here, the turtledeck section of the fuselage is being sheeted one half at a time.

The Full-Size Mite

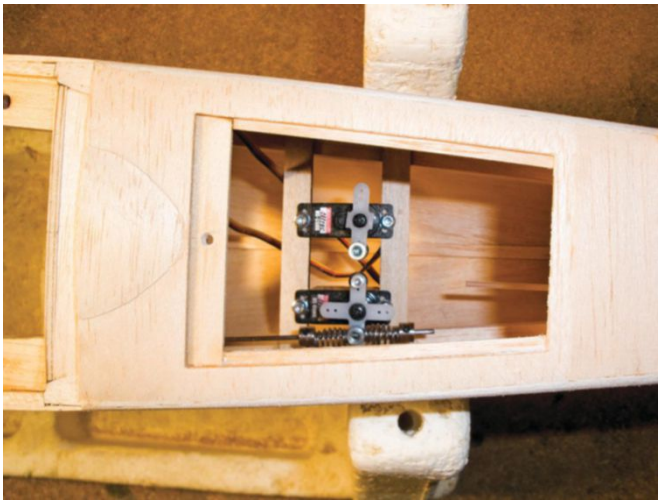
The Mooney Mite was designed by Al Mooney, and it first flew in 1947. The first few Mites were powered by 25hp modified Crosley Auto engines, then switched to Lycoming O-145 65hp engines and finally the Continental A-65 65hp engine. The Mooney Mite is 18 feet long and has a wingspan of 26 feet 10 inches and has an empty weight of 520 pounds. Its maximum speed is listed at 138mph, and it has a cruise speed of 125mph—not too shabby on only 65hp! The aircraft carried 11 gallons of fuel and had a maximum range of about 425 miles. The Mite pictured here—N4187—was built in 1957 and is registered as SN #352. It was refurbished in 2002-03 and sports the color scheme I chose for my model.



Eight layers of balsa sheeting are cut to shape and then stacked together with the use of an alignment block, then glued together. The cowl formers are then set in position over the motor. The spinner is attached to help define the shape of the cowl.



Here, the main retractable landing gear have been installed. Notice that the strut wires have been bent to the scale shape of the gear and fit precisely in the wheel-well openings.



To get to the servos, there is a large hatch opening aft of the wing saddle.

The finished fairing really cleans up the model's appearance.

for reinforcement for the 10-32 countersunk nylon bolts. Reinforce the wing top and bottom center section with three layers of 3/4-ounce fiberglass cloth, starting with a 2-inch-wide strip, then adding a 3-inch-wide strip, followed by a final 4-inch-wide strip of glass cloth. I use Pacer Z-Poxy to apply the fiberglass cloth strips.

Make templates for the retracts and wheel-well openings, then cut them out and trim to fit. You will need to bend the struts on the mains as shown on the plans. Take the struts out of the retract units to bend them to the correct angle using a bench vise. Now mark and cut out the ailerons.

FINAL ASSEMBLY

Check the incidence of the stab against the wing and the firewall. Again, the motor, wing, and stabilizer all should be set at 0 degrees. Sand and hinge the tail feathers, and glue the stab and fin in place. Install the rudder and elevator servos, using the 1/4-inch balsa as supports for the servo mounts. I used Du-Bro 0.032-inch micro pushrods for the rudder and elevators' pushrods and a Sonic-Tronics no. 115 Super Clevis on the 4-40 elevator control arms. Once the pushrods are installed, you can sheet the bottom of the fuselage with 1/16-inch balsa. Cut an opening and make a removable hatch for servo access, which also includes an opening for motor-cooling exhaust.

Cut a balsa block to shape for the forward fuselage bottom, and glue it in place. Then use the nose gear (retracted with wheel mounted) to mark an opening for the nose-gear strut and wheel. Do a final shaping of the cowl, bottom nose block, and the bottom sheeting behind the wing using 320- and 400-grit sandpaper.

CONTINENTAL A-65 ENGINE DETAILS

To install the Top Notch Kit's A-65 motor kit, I trimmed it to fit using the top view of the plans as a guide. I used a band saw to cut close, then used my Dremel sander to match the dimensions on the plans. I then installed a 1/2-inch piece of 1/8-inch dowel to the end of the cylinders so that I could glue them into the sides of the cowl.

Wing strake: Attach the wing to the fuselage, and glue the inboard strake rib to the fuselage. Then measure and install the second strake rib and the 1/4-inch square leading edge. Add the top and bottom sheeting, then shape and sand. You could also make these out of solid balsa blocks.

Wing fillet: Cut the two wing-fillet bases out

With its gear tucked away, the model climbs out on another flight. The Mooney Mite is stable and a lot of fun to fly. (Photo by John Kauk)

MAKE TEMPLATES FOR THE RETRACTS AND WHEEL-WELL OPENINGS, THEN CUT THEM OUT AND TRIM TO FIT. YOU WILL NEED TO BEND THE STRUTS ON THE MAINS AS SHOWN ON THE PLANS.

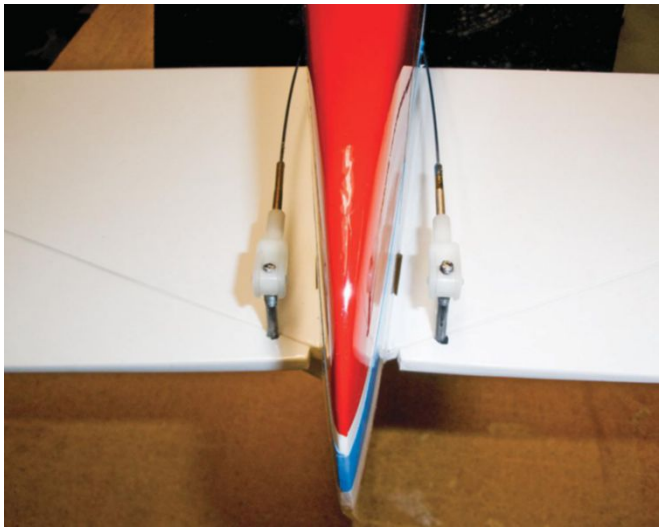
of 1/64-inch plywood, and trim them to fit. Use wax paper between the wing and saddle to prevent you from gluing the wing on. Then, with the wing installed, tack-glue them to the fuselage behind the wing and glue the wing-saddle area from inside. I cut and installed two pieces of balsa to support the top fillet sheeting. The fillets are actually pretty simple and are made out of flat sheets glued at an angle back to the back of the wing. Balsa blocks finish the fillets from the wing trailing edge back. (See side view on plans.) Now finish-sand the model, and cover it with your favorite iron-on material. Install your pilot bust, and add any details you like in the cockpit. Then cut and fit the canopy in place. I used the one for the Sport Aero Master from Park Flyer Plastics.

IN THE AIR

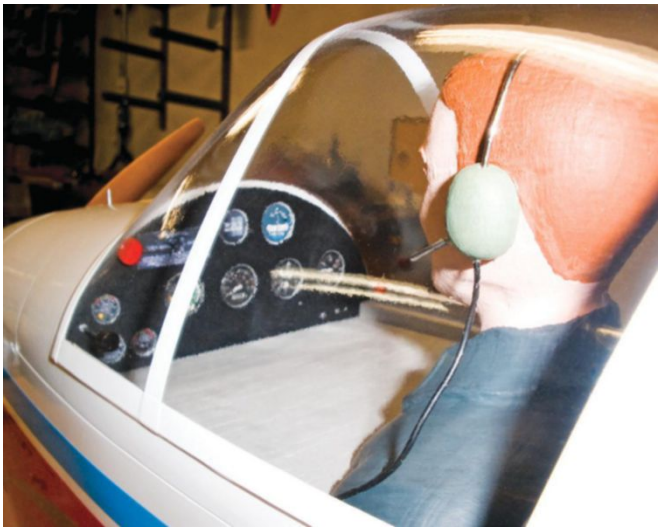
Balance the model with the gear up! The first flight of any new model always makes me nervous, but the Mooney Mite was a pussycat. It needed a couple of clicks of left aileron and a few clicks of down-elevator. I took it up high and did the dive test to check the center of gravity (CG), and it seemed to be neutral with the CG location I show on the plans. Again, going up high, I did some slow flights to check the stall-and-recovery characteristics of the plane—again, nice and mild.

Here are the control throws: elevator—15 degrees, rudder—15 to 20 degrees, and ailerons—15 degrees.

I am very pleased that it is pretty docile on the stall and recovery, and the built-in washout works nicely. Set up for landing, and carry some power down close to the flare. On subsequent flights, I opened up the flight envelope to loops, Immelmann turns, rolls, etc. With the Scorpion motor installed, it delivers 33.5 amps using 391 watts, for 111.7 watts per pound. It looks and flies great. I hope that, if you decide to build one, you'll love it too! If you have any questions or comments, you can contact me at densmodels@gmail.com.



The finished control-linkage assembly is clean and simple.



The molded canopy is available commercially and called out on the plans. You can add as much or as little cockpit detail as you like.

Product Watch

MINI REVIEWS OF EDITORS' FAVORITES

Spektrum Focal V2 FPV Wireless Headset

The new Spektrum Focal V2 Headset is designed around the serious FPV racer. The first thing I noticed is that it is a little bit larger due to the addition of the fan unit, which blows cool air inside the goggles so that they don't fog up on hot days. If you have ever raced in hot weather, you will really appreciate this addition. The fan is powered by the battery pack's balance plug; the switch turns it on for 10 minutes or until the battery is unplugged. Other additions include the antenna diversity, which features the FSV2445 V2 Fat Shark 32ch 5G8 Diversity Receiver Module, which is installed. The unit comes with 5.8GHz patch and omni antennae for excellent reception and image quality. Each eye is greeted with 640x480 optics, which are adjustable to match the user's eyes.

To see the battery power level, all you need to do is just push a button.

Two different types of antennae provide the best reception for the diversity system in these goggles.

There is a built-in module that allows the headset to communicate with any Spektrum transmitter that has wireless trainer–linked technology. This enables pilots to control the camera direction by simply moving their head. This is something that I don't use all that much for racing, but outside of racing, this can be used for the camera operator on a two-person system for cinematography drones. The other improved design is with the Fat Shark battery, which is custom-made to fit well in the head strap of the goggles. It is an 1800mAh battery, which gives you extended working time, and with a push of a button, you have an instant battery-level readout. I found these goggles to be very comfortable when wearing them for long periods of time, and the image was clear and sharp with a strong signal. The diversity setup did seem to help when flying in and around the trees at our courses. The battery lasted a good day of flying and through many flights. If you want a good-quality goggle setup for those long days of racing, the Focal V2 Headset is a wise choice. It costs $399.99.—*John Reid*

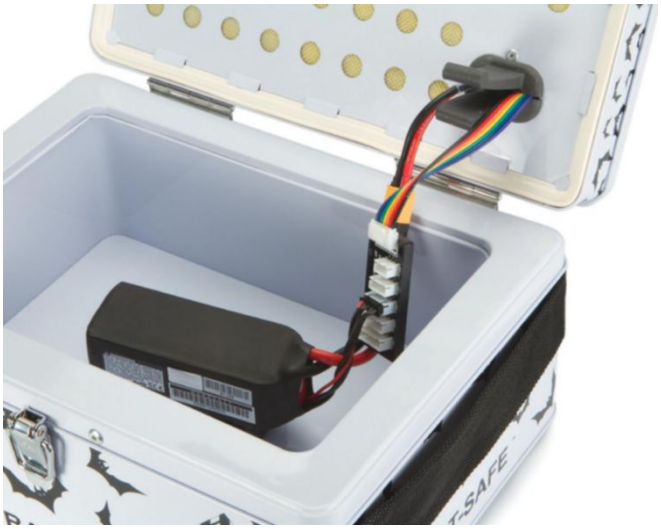
spektrumrc.com

Bat-Safe LiPo Charging Container

I know from personal experience how much smoke, fumes, and fire can be produced when your charger malfunctions and overcharges your LiPo battery pack. It is just too easy to become complacent and take LiPo packs for granted. I was lucky with my little surprise—nothing was damaged and no one was hurt. Now, however, I take everything about LiPo batteries very seriously. If you want to stack the deck in your favor, then you might want to take a look at the Bat-Safe.

Measuring 12 x 9 x 7 inches, the Bat-Safe is a professionally designed LiPo-charging solution that can be used to charge and store up to 12S 5Ah packs. Weighing a mere 4 pounds, the Bat-Safe has double-wall construction; fireproof seals; a spring-loaded latch for securing the lid; and a specially designed, airtight, synthetic wireway seal for the charging and balancing leads. Also included is a handy cloth carrying strap for easy transport and a metal attachment bracket to safely support your charger. The lid features a special fireproof filter material and has 60 half-inch-diameter openings that will let smoke and fumes out but prevent any fire from escaping.

To use the Bat-Safe, you first remove the wireway seal from the lid by pulling on the extensions from inside the container. The seal has two halves, and you place the charging and balance wires in between them and then insert the wires and the seal extensions into the opening in the lid from the outside. Pull the wireway seal down into place, and make sure that it seats properly on the top and bottom. The fit is solid, creating an airtight seal and preventing fire from escaping should your battery ignite. The metal charger attachment bracket has tabs that fit into the openings in the top of the lid, and heavy-duty Velcro fasteners are included to secure the bracket and your charger in place.



The Bat-Safe has double-wall construction and an airtight wireway seal to prevent potential heat and fire from escaping.

Priced at only $59.00, the Bat-Safe is a great insurance policy against faulty battery packs, which could cause damage when you least expect it. Even if you do use the Bat-Safe, it is always important to remember never to charge or discharge your battery packs while they are unattended. With the tremendous amount of energy contained in RC hobby-grade LiPo packs, you never want to take a chance. Safety first!

—Gerry Yarrish

bat-safe.com

The Bat-Safe lid has 60 filtered openings to allow any potential fumes and gas to escape.

BY **GERRY YARRISH**

DAWN DOGFIGHTER

Evasive action over the Sanford Aerodrome!

The early-morning sun reflects off the bottom of Chad Costamire's Fokker Triplane at the Blue Max event in Sanford, Florida.

Commander mPd™ 1.4m Park Flyer
A fantastic flying sport model from master designers Mirco Pecorari and David Payne (mPd). Features an ingenious Hands-Free Servo Connection System.

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Timeless design and 21ST century technology make these E-flite® park flyers modern classics that will be sport-flying favorites for years to come.

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Enjoy the inherent stability of a high-wing model with modern lines and sporty handling. Optional float set available separately.

BOTH FEATURE
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